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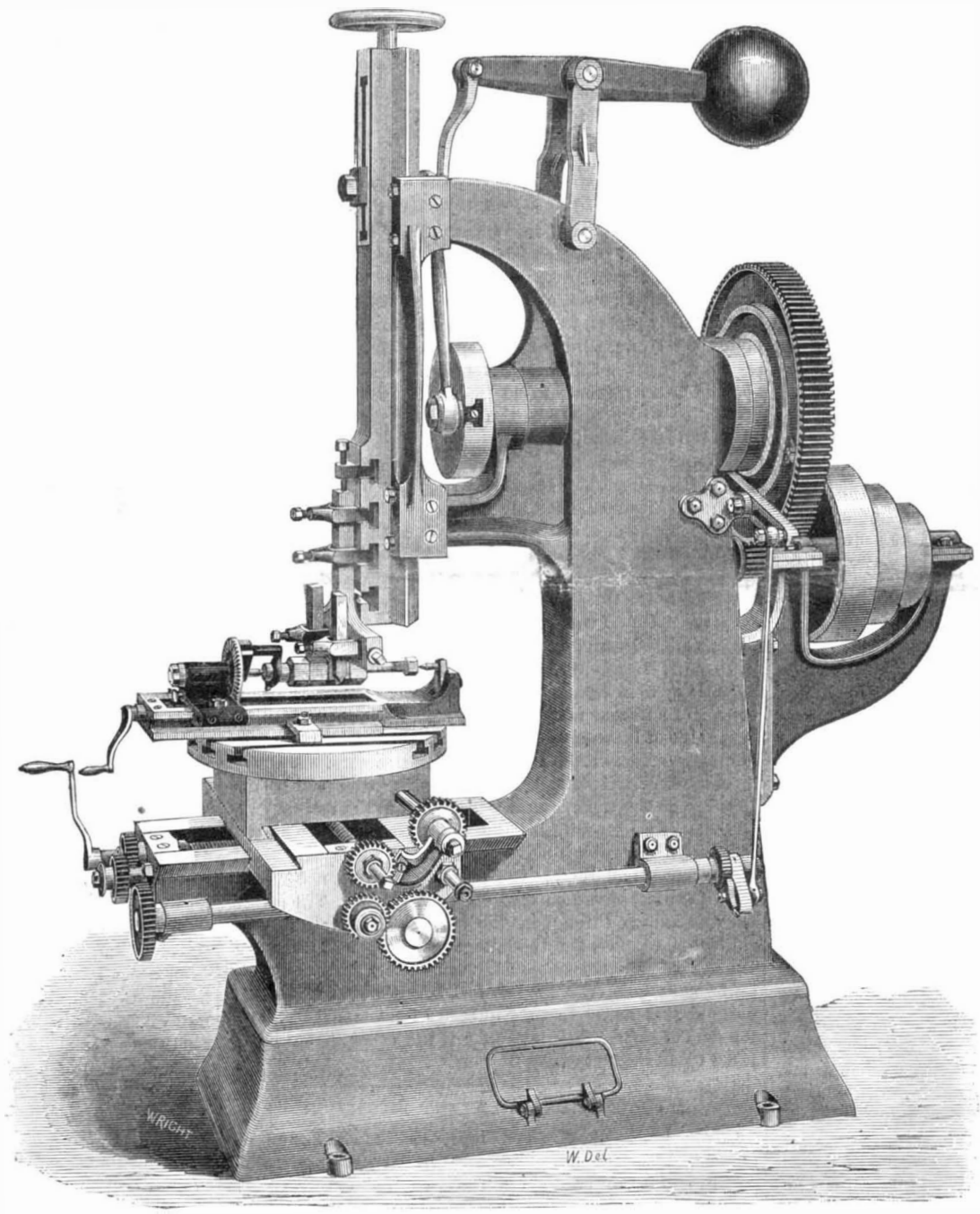
IMPROVED SLOTTING MACHINE AND SLOTTING AND PLANING TOOL.

Our engraving represents a new form of slotting machine, which combines a number of the best improvements contained in those of previous construction, making it a most compact and efficient machine with excellent proportions, which our engraving illustrates. As the general arrangement of the device is familiar to mechanics, no detailed explanation is required. A few dimensions, however, may be of interest in enabling the reader to form a better idea of the advantages and merits claimed for the invention. The extreme stroke, we learn, is 8½ inches, and will slot to the center of 36 inches. The bar, which has a vertical adjustment of 10 inches, has a continuous guide, and is so connected with the crank shaft as to have a quick return, while it is perfectly balanced by the lever and weight shown. The pinion shaft has a cone of three changes driven by a 3 inch belt, the largest end of the cone being 14 inches. The crank motion is driven by a gearing of seven and a quarter to one. The table is circular, has feed in three directions, longitudinal, transverse, and circular, and also possesses traverse of 16 inches longitudinally and 16½ inches transversely.

All the feeds are driven from one feed shaft in a simple and effectual manner. There are several minor conveniences about the machine which increase its value, and which the eye of the practical workman will readily understand.

To the ingenious slotting and planing tool, which is represented in position upon the table, we direct special attention. It consists of a steel yoke bar attached to the main slotting bar, to which, by screws and tool holders, the cutting tools are secured, so that the faces of the latter may be adjusted as far apart, within the capacity of the yoke, as desired. The piece to be planed—say, for instance, a bar which it is desired to form into a square, hexagonal, or octagonal rod, is placed on a center which connects with the index wheel shown on the left. This last is simply a disk having 24 notches cut in its circumference, and arranged with a stop, which, engaging with any notch, holds the wheel, and consequently the rod to be cut, in any desired position. From this it will be evident that, by turning the wheel regularly one notch ahead, the tools will plane a twenty-four sided bar, two notches a twelve sided, three an eight sided, and so on; so that a nut, for example, of any geometrical figure or section that has parallel sides, may be accurately and readily made. In attaching this appliance to a planer, the yoke is fastened to the clapper or tool box.



SLOTTING MACHINE AND SLOTTING AND PLANING TOOL.

The New York Steam Engine Company, of No. 98 Chambers street in this city, to which enterprising concern mechanics and manufacturers generally are indebted for the production of a variety of the best forms of standard metal working machines now in the market, are introducing the improved machine tool above described.

Further information may be had by addressing as above. Parties visiting the city are invited to call and see the machine at their warerooms.

New Results with Magnets.

The common idea is that, at each temperature, *t*, steel takes a certain magnetization, which is less as *t* is higher, and which it retains on cooling. This is not correct. M. Jamin placed a bar, heated in a sand bath so as to receive the blue color of springs, in a bobbin traversed by a current, and retarded its cooling (by a suitable arrangement). The steel took somewhat less magnetism than if it had been cold. Then he broke the circuit, and, on examining the remanent magnetism with a proof contact, found it much greater than the bar would retain if first cooled (109 grammes instead of 54). Thus the coercitive force does not diminish with heating, but increases. But if the force of detachment be again measured, minute by minute, it is found to increase, at first very rapidly, then less so, till in a quarter of an hour it has quite disappeared; and this whether the bar be kept hot, or allowed to cool naturally. The transition is almost continuous from total magnetization to remanent, which in time descends to zero. Now reheat the bar, but to a less temperature. Its total magnetization (while the current passes) is greater than in the former case; but immediately on breaking, the remanent magnetism is less than in that case; on the other hand, it disappears less quickly, and never entirely. Again, begin without heating the bar. The total magnetism is still greater; the remanent (on breaking) still smaller, and invariable with the time.

M. Gaugain observes that, when one has magnetized an iron bar as strongly as it is possible to do so with a current of given intensity, the magnetization may be considerably increased by using currents of the same direction, but of less intensity. This, however, depends on the mode of detaching the armature after interruption of the current; in these cases it was detached by a sudden movement at right angles to the polar faces; if it is detached by sliding along the faces, the feebler currents do not add to the magnetism developed by the stronger initial current. M. Gaugain considers the detaching of the armature weakens the magnetism; and this, through a shaking (*enbranlement*) of the molecules of iron, which diminishes the coercitive force. He works out a hypothesis of these and other phenomena.

TRANSPARENT GUM.—A little glycerin added to gum or glue is a great improvement, as it prevents the gum or glue becoming brittle. It also prevents gummed labels from having a tendency to curl up when being written on.

Fuller's Computing Telegraph.

It is singular to how small an extent general use is made of the various instruments which have, from time to time, been introduced for reducing the labor of numerical calculation. Some of these instruments are, no doubt, costly, but this is far from being the case with all. The "slide rule" is within the reach of every one; but how rarely do we come upon any person who uses it to a great extent? And yet the amount of fatiguing calculation a simple slide rule may save is something wonderful. Such rules can be made, and can be procured of special manufacture, which increases the range of their utility by enabling calculations to be made, embracing several figures. Another useful contrivance is the "computing telegraph" just reintroduced amongst us by Mr. John E. Fuller, of Boston, Eng., who first produced it some thirty years ago, and who since that time has been continually improving it, so that at the present moment it is a most complete instrument.

It consists of a squared board made of old tarred rope, a material which is not given to expansion or warping; upon this is pasted an engraved card, which has a graduated circle of the diameter of 8½ inches. Within this circle there is an inner circle, which revolves, and is graduated in the same manner as the outer circle. The divisions are from 0 to 10, completing the circle, and are the same for both; the divisions are similar to those of the ordinary slide rule, and decrease in a perfectly regular logarithmic order. In fact, the instrument is a circular slide rule. It possesses a great advantage over the ordinary straight slide rule, in consequence of its length (the actual length of the rule being 26·7 inches); this advantage is further increased from the circular arrangement being endless. Only one of 0 to 10 is required; while in the ordinary rule, one wants 0 to 10 and 10 to 100.

The instrument, in fact, forms a slide rule of a very perfect character, and enables one to work out the simplest and most complicated arithmetical question. In calculations where the same factor has to be used many times, the saving of time is simply enormous. Where in a multiplication sum the product is over four figures, and accuracy may be required, it is only necessary to make a mental calculation as to the tens and units, the computor furnishing the leading figures: for instance, $565 \times 179 = 101{,}135$; the slide rule at once shows the 101,1 and a small mental calculation gives 35 as the final figure. For engineers of whatever kind, such a calculating machine is invaluable, and no engineer's office, electrician's testing room, or manufacturer's counting house should be without it.—*Engineering*.

Sixty Miles an Hour on the New York Central Railway.

Recently, says the Syracuse *Journal*, a special train conveying Vice President Vanderbilt and other Central Railroad officials, consisting of an engine, (Mr. James Wood, engineer) and two passenger coaches, made the run from Rochester to Syracuse in eighty-five minutes, including one stoppage for water at Clyde of five minutes. This would leave the running time, the distance being eighty-one miles, eighty minutes, or at the rate of 60¾ miles in one hour. This is the fastest time on record between the two cities.

AMERICAN car wheels have now become a permanent and reliable item in our domestic export trade. In the year 1871 the number exported was 2,318; in 1872 it was 4,760, and in 1872 it rose to 7,515, despite the stagnation of the last four months. This is of much more importance to American industrial interests than the question whether our raw iron can be profitably exported to England.

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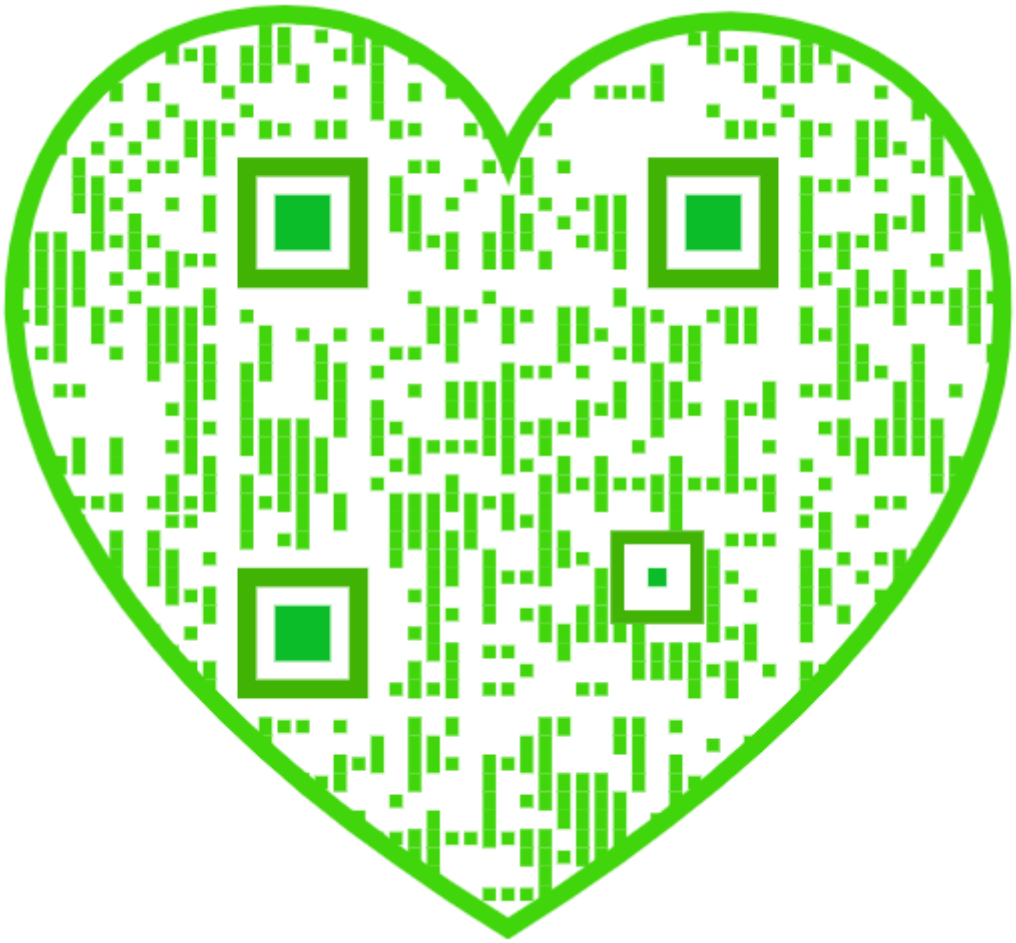

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A REMARKABLE REPORT ABOUT REMARKABLE PUMPING ENGINES.

The Providence *Journal* of March 2 publishes one of the most remarkable reports relating to steam engine performance that we remember ever to have read. The case seems to be as follows:

In February, 1872, a contract was entered into by the city of Providence with George H. Corliss, the well known mechanic, for the construction of a pumping engine to operate a high service level, on the Holley system, forcing the supply of water into the mains as fast as required to supply the continually varying demand. When consumers draw heavily, the pumps and the engine make twenty-five double strokes per minute. At night, and when the least amount of water is required, the engine makes sometimes a single revolution, or even less, per minute. The contract required the engine to be "capable of raising, with ease, five million gallons of water in twenty-four hours" to a hight of one hundred and twenty feet above low water, "under a possible varying head of forty feet on the suction," and to "work smoothly, steadily, and easily, when delivering but one million gallons in twenty-four hours." The engine was to have been completed on October 1, 1872, and its performance was to be determined by a board of experts, making a competition trial with the Worthington duplex engine, erected at the Pettacousett station, south of Providence. Should the Corliss prove equal to the latter engine in "practical value," the builder was to receive thirty-four thousand dollars, and "a further sum equal to the estimated annual saving (if any such saving shall be reported by the committee) for ten years," not to exceed a total of fifty-five thousand dollars.

The engine was designed especially for the work by the contractor; and having been but lately completed, the trial has been only recently made, the report being dated February 4 last, and signed by the well known experts Erastus W. Smith, Frederick Graff, and George H. Reynolds, who, after long delay, were finally selected to make the official test. The contract provided that the competition should take place at an average delivery of two millions of gallons in twenty-four hours. The head at trial was approximately eighty-eight feet. The tests were made of forty eight hours duration, and were apparently conducted, with the exceptions to be noted, with the care and intelligence to be expected of experts of high professional standing. The engines were, however, not overhauled, nor were the boilers cleaned, as they should have been to secure the most creditable results. The coal was not screened. The water supplied to the boilers was not measured, and no indicator cards seem to have been taken. Hence we are without any means of judging whether the extraordinary difference of efficiency was due to differences in boilers or in engines. It is not stated whether the engines and pumps were examined to ascertain whether leakage occurred or not. The quantity of water delivered was, however, determined by weir measurement, which probably gave the means of ascertaining pump leakage with sufficient precision.

The results obtained are the following, when raising two million gallons:

	Corliss engine.	Worthington duplex.
Time	48 hrs. 30 min.	48 hrs. 0 min.
Head pumped against	88·2882 feet.	87·9778 feet.
Gallons per twenty-four hours	2,051,563	1,992,649
Leakage of pumps, per cent	3·36	2·51
Coal used, pounds	11,700	5,686
Ashes falling through grates, pounds	1,028	486
Gallons raised, per pound of coal	342·19	689·37
Cost coal per year, at this rate	$7,352·00	$3,630·00
Duty, due pressure noted, foot pounds	25,865,740	53,528,210
" actual, by delivery	25,176,384	50,574,955

Both engines were tested for adaptability to varying rates of speed, and both were found satisfactory. Both engines are stated by the committee to be proportioned for a delivery of five millions of gallons in twenty-four hours, and they were both next tested under this higher load, and also at their slowest speeds, with results thus given:

	Slow Speed Trial.		Trial with 5,000,000 gals. delivery.	
	Corliss	Worthington	Corliss	Worthington.
Time occupied, hours	24	10¼	5¾	
Head pumped against, feet	88.16	88·223	118·174	120·299
Gallons raised per day	174,747	805,917	4,687,516	5,268,168
Coal consumed per 24 hrs., lbs.	1,427	1425·75		
Duty, 100 lbs. coal, foot lbs	8,487,370	36,878,346		
Cost, per annum	$5,208.58	$1,277.50		
Revolutions, per minute	0·866	7·81	23·23	47·49

On the basis of these trials, an award is made by the committee of the full amount of contract price, thirty-four thousand dollars, to Mr. Corliss. Two of the committee go still further than this, and recommend an additional gratuity of twenty-one thousand dollars, in view of the "great range of capacity" and "special adaptation" of the engine to the peculiar duty demanded of it. The third member demurs, stating that he believes that "the contractor has not accomplished anything valuable that he did not bind himself to do" by the terms of the contract, and that no "annual saving"—which was the condition of this extra compensation—has been shown.

We think this one of the most remarkable instances of inconsistent report that has ever come under our observation. A competitive trial shows an engine, at average duty, to have less than half the efficiency of another. At maximum duty, where both engines should have done most creditable work, and under which conditions the committee should have carefully determined the duty, whatever the terms of the contract, in order to obtain, in the only satisfactory way, a knowledge of the real value of the machines, no duty test is made. At a minimum performance, one machine making but 0·866 revolutions (!) per minute, and the competing engine 7·81, a duty test *is* made, and the results, which have not the slightest value as indicating their comparitive efficiencies, are placed on record. No marked superiority of either engine is shown in "adaptability" to the Holley system. No effort is made to determine how much of the astonishing difference noted is due to discrepancy in apportionment of boiler power, although the committee notice and refer, in their report, to an excessive disproportion. Yet, despite the terrible failure of the engine examined, the builder is not only given full contract price, but a majority of the board of experts recommend the full amount of extra compensation which was to be allowed if any annual saving was found to be effected, etc.

We cannot believe that the trials were conducted as they should have been, for such low duty can hardly be given where there is not something very wrong in the condition or in the management of the engine. Even the performance of the Pettacousett engine is lower than should have been expected. Comparing its 53,000,000 duty with the 70,000,000 reported of the little Worthington engine at Phœnixville, or with the splendid work done by the Leavitt engine at Lynn, Mass. (103,000,000), as given by Messrs. Worthen, Hoadley, Kirkwood, Hermany, and Davis, we must believe that something went decidedly wrong at Providence. We hope to hear of a new and a more satisfactory trial, in which the real value of both engines will be brought out by more careful management on the side of their constructors, and shown by some expert of established reputation, who will be disposed to do the work in such a manner that the real merit of the competing machines will be ascertained, and who will make a just award without fear or favor.

We cannot feel that, in the present case, either constructors or experts have done themselves full justice. The former are well known throughout the country as experienced and skillful mechanics, and the latter are equally well known as experts of unimpeachable high character, personally and professionally. We should feel much regret if the one party should suffer in consequence of mismanagement on the part of their subordinates, or if the other should be injured by an evident excess of charity.

A CONGRESSIONAL PATENT DISCUSSION

On the 28th day of June, 1859, McClintock Young obtained a patent for an improvement in harvesting machines, which, under the law then in force, expired fourteen years from that date. The patentee then had the right to apply for an extension of seven years, which privilege he exercised six months previous to the expiration of his time. The case lay in the Patent Office until the 27th of June, 1873, when the Acting Commissioner was asked to grant the extension, the matter having been fully adjudicated to that effect. The official postponed his decision until the arrival of the Commissioner, who, returning on the 28th, signed and issued the necessary documents. Young then sold his extension to McCormick, to whom the original patent had been assigned for $10,000, for an additional sum of $5,000; but before the latter consideration was paid, some lawyers raised the question as to the validity of the extension, on the ground that the patent expired on June 27, and that the extension should have been as of that date instead as of the following day. Under the law no extension could be granted after the expiration of the original patent, and hence the point at issue arose, whether or not the same occurred on June 27 or June 28. The Commissioner held that June 28 was the proper date; but in order to avoid litigation, a bill was recently introduced in the House of Representatives to remove all doubts on the subject and to confirm the validity of the extension by giving to it the same binding effect as though it had been signed by the Commissioner on June 27, 1873.

We hardly think that the most penetrating scrutiny would ordinarily perceive any deep, dire, and hidden signification underlying this very simple statement of fact. To the average intellect, it appears that a poor inventor comes before Congress and asks that body to rectify a mere clerical error on the part of one of its officials, in order that he may receive the small sum offered him as a reward for his labor and not be deprived of the same through the expenses of tedious litigation. He cannot afford to take the matter to the courts and wait for a decision, even if such were the proper course; but, armed with a written opinion of the Commissioner directly in his favor, simply requests our representatives to quiet a legal quibble raised as to his undoubted right to his own justly earned property.

But several acute and far reaching minds in the House are not to be deluded by any such specious argument as this, it must be investigated and examined, over twelve columns of fine print in the *Congressional Record* and some hours of valuable time. This is an attempt to embarrass the entire agricultural population, to reduce the rural granger to penury and want; to impose a grinding monopoly on industry, no matter if it is through a little improvement on a well known machine, the whole patent right of which is to bring the inventor $15,000. Besides, reason our astute legislators, this is not the hat case, or the planer extension, or the sewing machine job, and there are no poor widows or lobby agents or other skilled talent to explain things to our satisfaction. It is only a poor man who asks for his own; therefore we will call his bill "dangerous legislation," assume (whether rightly or not) that his patent wound up on the 27th, and show that we are utterly opposed to Congressional extensions by considering that he asks us for one, no matter whether the facts substantiate the view or not; we will persistently perceive only the McCormick machines, even though they are not before us and have nothing to do with the subject, so that we can indulge in heroics over the vast amount paid by the public for the same, and by this means we shall advertise ourselves in the eyes of the people and glorify our names before the SCIENTIFIC AMERICAN and other journals that make disagreeable remarks about monopoly jobs.

In the end, however: after these ingenious special pleaders had suggested enough buncombe and nonsense, had questioned and cross-questioned the supporters of the measure, and made them state the case over nine times, had wasted hours of valuable time where minutes would have amply sufficed, pushing aside business of the highest importance, the completion of which the country urgently requires: on a vote being taken the opposition were fortunately found in the minority, and so the bill was passed.

DANGERS OF NURSERY EXPLOSIVES.

Recently, in this city, the front of a toy store on Broadway was blown out, and several persons badly injured, by the explosion of percussion wafers—bits of paper having a small quantity of explosive material upon them. The wafers were used for firing off toys termed "parlor artillery." The toy consists of a small barrel provided with a hammer, under which the wafer is fired, a ball of rubber being thrown out of the barrel on pulling the trigger.

The sale of explosive toys, no matter in what form they may appear, should be discouraged. We have seen children severely burned by the apparently harmless pulling crackers, through accidental explosion. Explosives have no place in the nursery.

AMERICAN SODA.

One hundred and eighteen thousand tuns of crude soda at fifty dollars per tun is reported as about the annual importation of this salt, used, as our readers know, in the manufacture of soap, glass, and other articles of general consumption. This will convey some idea of the importance of the great and wonderful natural deposits of carbonate of soda, which have been found in the West, six hundred miles beyond Omaha, and forty miles north of the Union Pacific Railway. Deposits of soda are here found in all stages and conditions. In some cases, alkaline lakes are encountered, the water saturated with the carbonate. One especial deposit, of many acres in extent, consists of a crust of carbonate of soda more than six feet deep, under which is a strong alkaline liquid. This great deposit lies there, waiting for people to come and take it away. In quantity there is enough to supply the wants of the world for an age. In quality it is superior to the crude article now manufactured, as it contains twenty per cent more of carbonate of soda; while in cost it is very cheap, as it may be delivered in New York, when the railway to the deposits is opened, for thirty dollars per tun. The soda trade is evidently destined to change. Instead of employing vessels to bring the product here, we shall soon fill them with improved cargoes of the article to go abroad.

THE GREAT LAVA FLOOD OF OREGON.

Professor Joseph LeConte, of the University of California contributes to the *American Journal of Science and Arts* the results of observations made by him during a geological tour in Eastern and Central Oregon. He states that probably the most extraordinary lava flood that ever occurred once covered the greater portion of Northern California, and Northwestern Nevada, nearly the whole of Oregon, Washington, and Idaho, and ran far into Montana on the east, and British Columbia on the north. Derived from streams originating in fissures in the Coast, Cascade and Blue Ranges, it covered an area of 300,000 square miles to an average thickness of 2,000 feet. The whole Cascade range is composed of lava, tier upon tier from top to bottom, forming a depth in some places of 4,000 feet. The order of events which occurred in the region of the Columbia river is graphically depicted

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and the writer gives with considerable detail the natural phenomena which lead him to the conclusion that the locality was a forest, probably a valley overgrown with conifers and oaks. The subsoil of this forest was a coarse boulder or drift. By excess of water, either by flood or changes of level, the trees were in time killed, their leaves shed and buried in the mud and their trunks rotted to stumps. Then a tumultuous and rapid deposit of coarse drift, containing drift wood, covered up the forest ground and the still remaining stumps to the depth of perhaps several hundred feet, the surface thus formed eventually becoming eroded into hills and dales. Over a long period following came the outbursts of lava in successive flows, with the silicification of the wood, and the cementation of the drift by the percolation of hot alkaline waters containing silica, as happens so commonly in sub-lava drifts. Finally succeeded the process of erosion by which the present stream channels, whether main or tributary, have been cut to their enormous depth.

In referring to the age of the Cascade range, Professor Le Conte concludes that it was first born of the sea, by horizontal washing and vertical swelling, probably at the end of the jurassic, though only as a low range, continuing the sierra northward; its subsequent increase took place at the end of the miocene, by the outpouring of the great lava flood above described.

SCIENTIFIC RESULTS OF THE POLARIS EXPEDITION.

The report of the voyage of the Polaris, now issuing from the Government printing office, contains a memorandum by Dr. Bessel on the scientific results and discoveries of the expedition. Large numbers of astronomical observations were made, but the records were all lost, with the exception of a few of little value. Soundings were taken along the coast of Grinnell Land, which proved that the hundred fathom line follows the coast at a distance of about fifteen miles from Smith's Sound. One of the casts brought up an organism of still lower type than the *bathybius* discovered by the English dredging exposition. It was called the *protobathybius robesonii*. The aurora was frequently observed, but it never appeared with sufficient brilliancy to produce a spectrum. The most careful examinations failed to show any electricity in the atmosphere. The land was covered by drift, the main line of which, indicating its motion, runs from north to south.

Although the details of the discoveries are very meager—and, owing to the loss of specimens as well as records, nothing can be done to amplify them—Dr. Bessel believes that the voyage has not been without results of the highest importance. These he summarizes as, first, the fact that the Polaris reached 82° 16′ N., a higher latitude than has been attained by any other ship; second, the navigability of Kennedy Channel has been proved beyond a doubt; third, upward of 700 miles of coast line have been discovered and surveyed; and fourth, the insularity of Greenland has been demonstrated.

NERVE FORCE.

Dr. Brown Séquard is delivering, in Boston, a course of lectures on a topic regarding which little is positively known to the world in general, and which, so far as popular ideas are concerned, is so ensbrouded with fogs of animal magnetism, electro-biology, power of the will, psychic power, and kindred theories, that there are few who can definitely and clearly lay down the certain facts which modern investigation has proved to be true. There are not probably many physicians who have made the matter one of such deep and extensive research as has Dr. Séquard; and hence the discourses and opinions emanating from so high an authority are especially welcome, and the very curious and instructive information contained in them will, from the very circumstance of its being so little understood, have the additional charm of new revelations in science.

There are two elements in the nervous system, which, united together, are nevertheless absolutely distinct. One is the nerve cell with its filaments or prolongations, the other the fibers. Within the nervous centers, that is, the brain and spinal cord, there is but one of these fibers united with the cells. In other parts of the body there are cells which have two real fibers starting from them, besides the ramifications. Produced in these elements is the force which manifests itself in nervous actions, but it is proved that nervous force can nevertheless exist without the elements. In some low forms of creation, there are tissues which do not represent at all the known elements of the nervous system, and by disease the latter organization in man may be transformed beyond recognition, and yet the nervous force still manifests itself. There is no likelihood, however, that nervous force can show itself outside the boundaries of the system, no facts in proof of such an idea and hence at the very outset, Dr. Séquard deals a crushing blow at the fundamental theories of animal magnetism. The transformation of nervous into motor or other forces is, however, possible, and is constantly exemplified in the actions of our bodies. Certain animals evolve light as a transformation of the force, others electricity; and Dr. Séquard tells us that, in severe cases of consumption, patients in a high state of nervousness evolve visible illumination from the lungs. The chemical changes occurring in the body take place under this influence; there seems to be, although the circumstance is not definitely decided, a transformation of light, acting upon the retina, into nervous force, and motion such as shampooing or kneading of the limbs all increases its quantity, as does also heat. The application of heat to children, the lecturer considered, is exceedingly useful to help their development. If the air they breathe is cool, and warmth is applied to their limbs, but not so much to the body, they certainly grow faster.

The blood is necessary to the production of nerve force itself, but oxygen alone can supply some power. Strychnin has also a remarkable effect. The influence of the will is very slight, and this is a wise provision of Nature to prevent foolish waste. Dr. Séquard considers that moderate exercise will lead to a production of nerve force and facilitate the employment of our brain power: but there is no question that if we draw away more of the nerve force from our system than can be reproduced in a given time, if we walk very fast, for instance, for five or six hours, we become unfitted for mental work. We are weakened in every organ depending upon nervous force, the heart and the lungs especially, and hence it appears that the same focus supplies the force both for physical and mental action. The power is distributed as is galvanism on a cylinder; and if a cause operates to divide the system into halves, each half has only the amount of nerve force it had before. The fact of our really having two brains is no objection to the unity of the force, because every part of our nervous system is in close communication. We cannot touch a part of the skin or any other portion of the organization without producing a commotion all over the nervous system.

Excitability and nerve force are two very distinct things. Strong persons will generally not be moved by the former cause, while on the contrary persons who have but little nerve force will react under it, however slight, without giving the mind time to think what it is. In health, nervous power and electricity are both present, but they are clearly not the same; for the speed of the former is only from 80 to 200 feet per second, while the latter travels a distance thousands of times greater. There are two great influences of nerve force, the production of activity either normal or morbid, and the cessation of the same. The brothers Weber discovered that when the big nerve in the neck which goes to the heart is galvanized, the organ stops passively and not actively as do the muscles of the arm when similarly influenced. It is believed that all such phenomena occur through the same mechanism. An irritation starts from a part which can convey nervous force, and the latter, reaching the cells of gray matter which were active, immediately stops them. Dr. Waller has found that, by pressing the same nerve, called the *par vagum*, that the motion of the heart is arrested to a certain extent, and relief afforded in cases of headaches, neuralgia, and similar maladies.

Dr. Séquard says that experiment has shown that there is much greater vitality in animals in America than in Europe. Peeple can withstand more terrible injuries, and the animals of this continent seem to have a less tendency to death by hœmorrhage than those across the Atlantic. In addition to those already cited, there are many other causes which will often stop the heart's action; a severe blow on the abdomen, a sudden douche of cold water, chloroform, and carbonic acid in the larynx are cited as examples. Galvanization of the cervical sympathetics, often resorted by physicians as a cure for headache is very dangerous for a similar reason.

There is no doubt that the respiratory movements are all due to the activity of cells of gray matter, just as the movements of the heart are; the cells of gray matter, as regards respiration, being placed on the base of the brain and in a part of the spinal cord. The same nerve, the *par vagum*, which goes to the heart, has a set of fibers which, instead of going down, go upward and toward those cells of gray matter in the base of the brain and spinal cord. So that if you divide the *par vagum*, having one hand by which you can act on the heart, and another by which you can act on the brain, you can at will, at one moment, stop the heart's action, and in another stop the respiratory movements. The stopping of the respiratory movement is very peculiar, and two kinds of fibers are able to do it. One goes to the larynx, acting by the superior laryngeal nerve, and acts by the cessation of the diaphragm, which is a muscle of the chest. The other need not here be described. Respiration can also be stopped by carbonic acid in the larynx. Palpitation of the heart may be diminished by breathing in forcibly as much air as possible. In health, therefore, every act of breathing is a moderation of the heart's action. The morbid phenomenon of respiration can also be stopped by the influence of arrest.

Coughing, for instance, can be stopped by pressing on the nerves of the lip in the neighborhood of the nose. A pressure there may prevent a cough when it is beginning. Sneezing may be stopped by the same mechanism. Pressing also in the neighborhood of the ear, right in front of the ear, may stop coughing. It is so also for hiccough, but much less so than for sneezing or coughing. Pressing very hard on the top of the mouth inside is also a means of stopping coughing. And the will has immense power there. There was a French soldier who used to say, whenever he entered the wards of his hospital, "the first patient who coughs here will be deprived of food today." It was exceedingly rare that a patient coughed then.

ACOUSTIC DARKNESS AND MENTAL LIGHT.

Professor Tyndall, in the course of a recent investigation into the performance of the signals which, by loud sounds audible at considerable distances, serve to warn vessels approaching dangerous coasts during foggy weather, has been led not only to the determination of some important facts regarding the acoustic transparency and opacity of the atmosphere, but to the exemplification of how the imagination may be scientifically employed in the solution of apparently unanswerable problems. The sound producing apparatus consisted in two large brass trumpets, 11 feet long and blown by an air pressure of 18 pounds, two locomotive whistles, and an 18 pounder gun fired with a 3 pound charge of powder. Professor Tyndall embarked aboard a small steamer, which, under his direction, was moved from point to point from the locality of the sounding instruments, South Foreland Cliff, near Dover. The observations were carried on over several days, with varying results, some of which the investigator found himself at a loss to explain. Thus, on one day the distance at which the sound could be heard was 5½ miles; on the next day, 10 miles. The former day the wind was in the direction of the sound; on the latter, the wind was opposed. Again, on another occasion it was noted that the sounds were not impaired during the continuance of rain; though this state of the atmosphere, according to expressed opinions, should have deadened them. A clear atmosphere has been extolled as the best for sound; but the noise of the horns, says Professor Tyndall, was heard 12¾ miles dead to windward of the cliff, and while the latter was obscured by a thick haze. It was a curious and incomprehensible fact that, under these conditions, the sound ranged at least twice as far as it had done on days when neither haze nor wind was there to interfere with it. To add to the perplexity of the investigator, subsequently to the observation of the above phenomena, on a perfectly bright, clear day, with smooth sea and no wind, not a vestige of sound of either horn, whistle, or gun could be detected at a distance of two miles. He says he stood "amazed and confounded," for he saw no palpable clue to the solution of the problem. It was a case where one's senses are of no use, where they and all the philosophical instruments in the world cannot be of the least assistance. How, then, is it to be answered? There is the least shade of exultation in Professor Tyndall's crisp sentences when he announces that by the scientific use of the imagination—a process of reasoning of which he is the firmest advocate, although many have deemed his masterly treatise on the subject loose and illogical—he was led to a satisfactory explanation. His mind sets itself at work. Sulphur, reasons he, is exceedingly transparent to radiant heat, whereas the ordinary brimstone of commerce is highly impervious to it. Why? Because the brimstone does not possess the molecular continuity of the crystal, but is a mere aggregate of minute grains, not in perfect optical contact with each other. When this is the case, a portion of the heat is always reflected on entering and quitting the grains. Hence, when the grains are minute and numerous, this reflection is so often repeated that the heat is entirely wasted before it can plunge to any depth in the substance. A snowball is not optically continuous ice, but an aggregate of grains of ice; and the light which falls upon the snow, being reflected at the limiting surfaces of the snow granules, fails to penetrate the snow to any depth. Thus, by the mixture of air and ice—two transparent substances—we produce a substance nearly as impervious to light as a really opaque one. And this is equally true of foam, clouds, and all transparent substances in powder. But to proceed further. Humboldt, in his observation of the falls of the Orinoco, found that the noise was three times louder by night than by day. The plain between him and the water consisted of grass and rock intermingled. In the heat of the day, the temperature of the rock was 30° higher than by night. Hence, he inferred that over every heated rock rose a column of air rarefied by heat, and he ascribed the deadening of the sound to the reflections which it endured at the limiting surfaces of the denser and rarer air. Thus he proved that a non-homogeneous atmosphere is unfavorable to the transmission of sound.

Professor Tyndall says that, as he thus reasoned and stood on the deck of the steamer pondering the question of what could so destroy the atmosphere over a calm sea as to enable it to quench in so short a distance so vast a body of sounds, he became conscious of the exceeding power of the sun beating against his back and heating near objects. Here was a clue, and the rapidity with which he followed it is well shown in the short, terse sentences which sum up a complete explanation of the mystery. "Beams of equal power," says the Professor, "were falling on the sea, and must have produced copious evaporation. That the vapor generated should so rise and mingle with the air as to form an absolutely homogeneous mixture, I considered in the highest degree improbable. It would be sure, I thought, to streak and mottle the atmosphere with spaces in which the air would be, in different degrees, saturated or, it might be, displaced by the vapor. At the limiting surfaces of these spaces, though invisible, we should have the conditions necessary to the production of partial echoes and the consequent waste of sound."

Following up this mental conclusion with experimental test, it was found fully verified. A cloud coming before the sun checked the production of vapor so that sounds, before inaudible at three miles distance, became clearly heard. Again, as the sun went down, the signals became louder and further recognized to such an extent, it is stated, that at 6 P.M. the sound had risen to more than fortyfold the intensity which it possessed at 2 in the afternoon. And thus, by a simple use of the imagination, by conceiving of a state of nature which the senses could not indicate, the investigator was led to a result susceptible of the clearest material proof.

TAKE CARE OF THE MATCHES.—A Great Barrington (Mass.) merchant found a box of parlor matches on the store floor the other morning, which had been knocked off the shelf by a rat or mouse overnight. On opening the box the discovery was made that by the concussion every match in the box had been lighted, and the wood of which they were made was charred and turned brown. Fortunately the box was so tight as to smother the fire, and no harm resulted. It was a narrow escape; and if a fire had taken place, its cause would have been a perpetual mystery.

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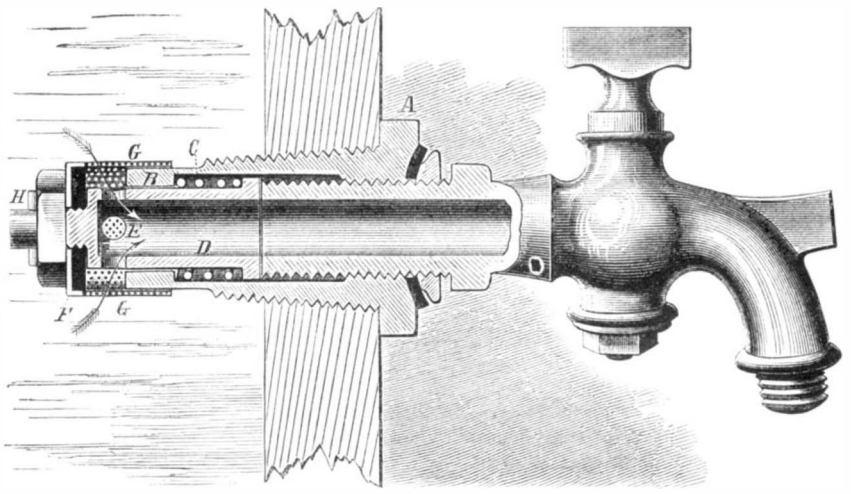
IMPROVED SELF-CLOSING FAUCET ATTACHMENT.

The invention represented in our engraving is a simple attachment for barrels and similar receptacles, which is so constructed that a faucet may be inserted with ease and safety for drawing off the contents, thus obviating the use of corks and the destruction of barrel heads by the repeated driving in of the corks now commonly used in lager beer and other casks. The inventor claims that the device is particularly suitable for large butts or tanks in breweries, and that it has been successfully used in such establishments.

Our engraving represents the invention inserted in a cask, shown in section, to which the metal faucet tube, A, is applied by means of an outer screw thread with conical inclination. The head of the latter projects a little outside of the wood. At the inner end of this tube is a collar, B, which serves as a rest for the spiral spring, C. The latter is coiled about a tubular valve, D, in the rear portion of which are made apertures, E. The extremity of the valve is solid, of smaller diameter, and carries, by a nut, the soft rubber disk, F, and also the strainer, G. The strainer, it will be noticed, fits closely over the end of the tube, A. The effect of the spring, C, and the nut, is to press the disk, F, tightly against the tube, A, so that no liquid can escape therefrom. The object of the tube is also to hold a faucet, which is provided with suitable washers, and screws in as shown. When it is desired to draw off the liquid, the faucet is turned in far enough to strike the valve, D, forcing the same back, so that the disk, F, is carried toward the inside of the barrel, and the apertures, E, pass to the outside of the tube, A. The apparatus will then be in the position represented in the illustration. The liquid consequently enters through the openings, E, and the strainer, G, into the valve, and thence to the faucet, by which it may be drawn off at pleasure. The strainer, G, prevents any impurities from passing out, and may be cleaned by unscrewing the tube, A, from the barrel after the same has been emptied. By means of the hole and pin, H, through the end extension of the valve, D, the connection of parts is still further secured. On withdrawing the faucet the valve attachment closes upon the tube, A, and the barrel is ready for refilling. When the cask is shipped, the cavity in the tube may be closed and sealed.



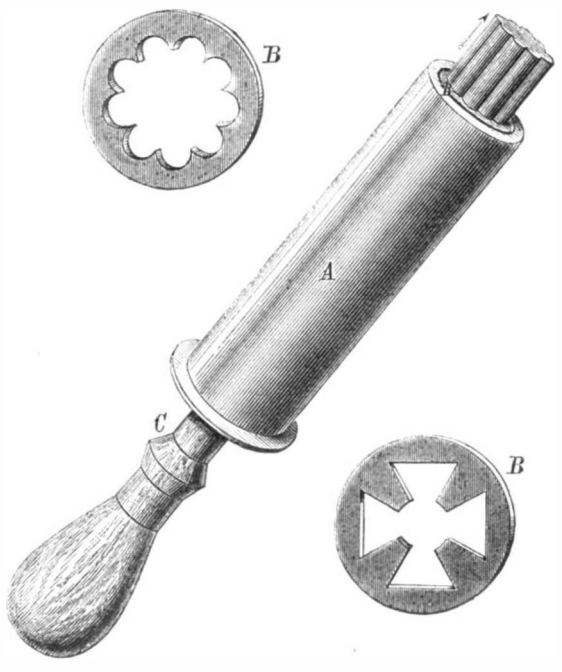
IMPROVED SELF-CLOSING FAUCET ATTACHMENT.

The device is made of brass or malleable iron coated with tin, as desired, and of any size, from one quarter inch to three inches in the discharge passage. It can also be used with globe cock connections and hose for filling casks or for withdrawing the contents, as may be desired.

Patented through the Scientific American Patent Agency, September 30. 1873. For further particulars address Mr. R. McConnell, Box 1,037, Omaha, Neb.

WATSON'S BUTTER FORMER.

The object of this device is to produce ornamental forms in butter for table use with economy and dispatch. It consists of a tin tube, A, provided with a die, B, which slips into the same at its upper end; these, with the follower, C, which is merely a wooden plunger fitting the tube, constitute the



entire apparatus. In using it, the butter, in a moderately firm condition, is made into a roll, placed in the tube, and forced through the die by the plunger, C; it issues from the end in a long roll, having the configuration or shape of the die. It is afterwards cut into short pieces for individual use, arranged in a coil, or piled crosswise on plates, as taste may dictate. Butter so formed has an ornamental appearance that adds greatly to the attractions of the table.

Patent pending through the Scientific American Patent Agency. For further information, address Egbert P. Watson, 42 Cliff street, New York.

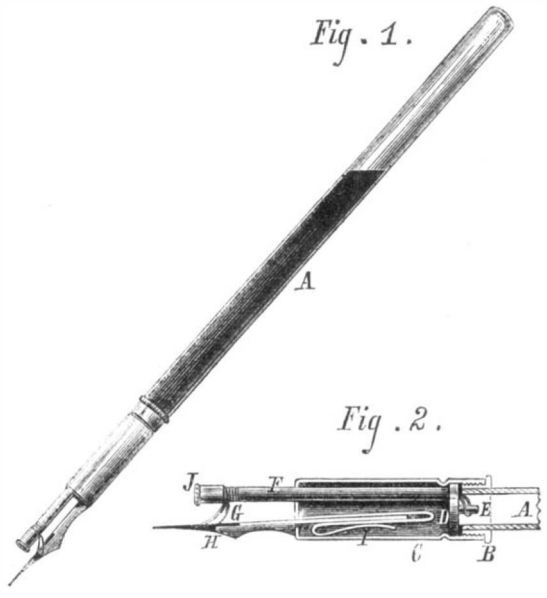
The Thermal and Mechanical Properties of Air.

Professor R. H. Thurston, of the Stevens Institute, has recently forwarded to us a copy of a valuable chart which he has lately prepared, which graphically exhibits the thermal and mechanical properties of air. One hundred cubic feet of the gas, at 60° Fahr. temperature, is taken as unity, and curves are constructed exhibiting the changes of temperature, pressure, and volume. The curves, three in number, indicate respectively temperature and pressure, the no transmission of heat or adiabatic line, and uniform temperature and varying pressure or isothermal line. By the aid of suitable scales, the coincident volume for any given pressure may be quickly read off; or conversely, the pressure corresponding to the change of volume already known may be noted. The temperature, similarly, due to any given degree of compression, can be easily found.

The work, we think, will prove both useful and acceptable to students of science as a means of saving many long calculations. It is handsomely photo-lithographed. The drawing, which, we understand, was performed under Professor Thurston's direction by one of the students of the above institution, is admirably accurate, and deserves more than a passing word of praise.

FONT PEN WITH A CAPILLARY FEEDER.

This is an ingenious little device, which will, doubtless, meet with a ready welcome from all whose daily duties necessitate a large amount of writing. It is a penholder in which any form of pen may be used, and which contains a



large supply of ink in its glass handle. The fluid is fed to the pen by capillary attraction, so that the latter is kept constantly supplied as long as the contents of the reservoir last. The apparatus is made of neat and convenient form, and of metal or rubber that will not corrode with ink or be injured when washed in water.

In our illustrations, Fig. 1 shows the device complete, and Fig. 2, a section of the apparatus for feeding and holding the pen. A is the extremity of the glass handle or reservoir, which is provided with a ground neck and a screw ring, B, which engages with the tube, C, and is packed with a rubber ring. D is a disk plate, fitting (movably) in the tube, C, and against the end of the holder, and carrying a pin, E. Around the latter is shown the loop of a doubled thread which passes down through the tube, F, its ends protruding at G, to touch the pen, H. The shank of the pen is firmly held in a bent spring, I.

To use the invention, the glass handle is unscrewed and filled with ink, and then re-attached to the tube, A. This may be done easily and without spilling the fluid. The ink moistening the ends of the pen and the thread, writing can be at once proceeded with, as the ink, as drawn by capillary attraction down along the latter, exudes from its ends, G, and so constantly supplies the pen. The quantity of ink allowed to escape is regulated by the cap, J, which screws over a slotted opening in the tube, F. The ends of the thread, G, emerge through a slot, and, by screwing the cap up tighter, may be compressed to retard or close the passage of the fluid as desired. After being written with, the pen is laid aside, and never leaks, although the cap may remain open.

We are informed that, when once filled with ink, the pen will be always ready for service during days or even weeks. If any variety of good writing fluid be used, no trouble need be experienced from dust or drying. Almost any sort of pen may be employed, and inserted and charged as readily as in the common holder. The invention, as a whole, appears quite efficient and useful, and, we should imagine, would prove a saleable addition to the stock of any stationer.

Patented through the Scientific American Patent Agency, February 10, 1874. For further particulars, address the Font Pen Office, No. 7 Murray street, New York city. [See advertisement in the present number of the SCIENTIFIC AMERICAN.]

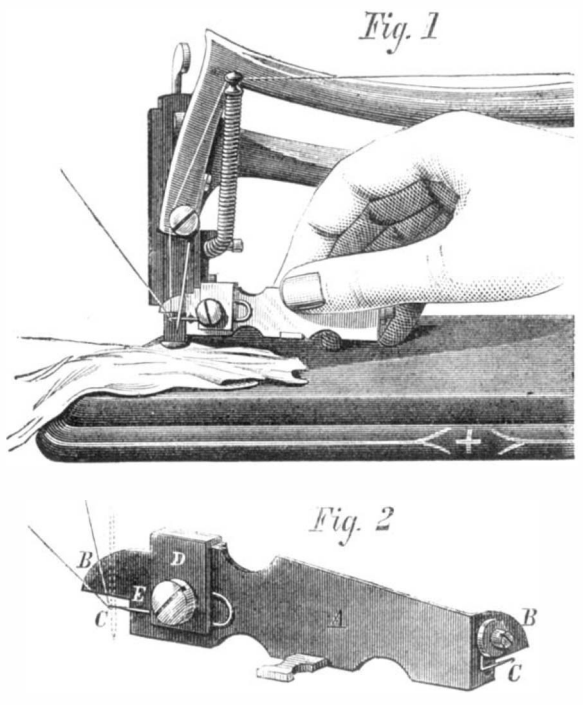
The Prevention of the Sweating of Leather.

A correspondent of the *Deutsche Gerber Zietung* reminds leather dressers of the evils arising from the use of impure oil. He refers to the nefarious practice of dishonest dealers in oil of mixing resin (which is 50 per cent cheaper) with the pure fish oil. The consequence is that the leather, after laying some time, begins to show resinous spots, sometimes so numerous as to cover the whole surface of a hide. Though pointed out some years ago, it was again observed in the leather exhibited at Vienna. The same correspondent suggests as a remedy the application of spirit of sal ammoniac to the leather, which, though it must be repeatedly used, he asserts to be effective. According to a communication of Dr. Lahrmann, in a later number of the same journal, the causes of this exudation must not alone be sought in the bad quality of the oil, but are to be partially attributed to the action of oxygen on the oil, the exudation being more frequent if the leather is freely exposed to the air. He recommends the use of fish oil which has been used and has already undergone the prolonged chemical changes to which fresh oil is not subjected, and which, if they take place in the leather itself, eventually involve the decay of the latter. He further strongly deprecates mixing fresh oil with the fish oil, advising the use of the latter alone.

SCHOFIELD'S IMPROVED NEEDLE THREADER.

This is an ingenious and useful little invention which will doubtless save many trials of the patience as well as of the eyes. The inventor states that it will prove especially useful in threading medium and very fine needles, and that persons totally unskilled in its use can, after an hour's practice, readily draw the end of the thread through the eye as rapidly as twenty-five times in a minute.

Our engravings show its mode of operation so clearly that but little description is needed. The body, A, Fig. 2, is of thin sheet metal, and has a lateral foot to hold the instrument in an upright position. The projecting guide piece, B, is passed up and down along the side of the needle until the hook, C, which is placed in the same direction as, but slightly to the side of, the guide, strikes the eye and passes through it. The hook is of steel and made of various sizes, some small enough to be used with the finest needles. Its rear portion is bent in U shape, and is held in a groove in the handle by means of plate, D, and screw. The projecting portion of the handle beside the hook carries a small set screw, the extremity of which is represented at E, Fig. 2. This bears against



the hook and regulates the distance of the same from the guide, B, to be adjusted for needles of different thicknesses. At the other end of the handle a hook and needle guide are placed in similar manner, but at right angles to the body, so that needles may be threaded from the sides, back, or front, as desired.

A child, it is stated, may learn to use this device in a few moments, while its use cannot but result in a considerable saving of time and trouble. The mode of holding it in the hand is clearly shown in Fig. 1.

Patented through the Scientific American Patent Agency, September 23, 1873. For further particulars regarding sale of rights, or for samples (a handle and a dozen hooks will be mailed for $1.50), address the inventor, Mr. Thomas Schofield, Grass Valley, Nevada county, Cal.

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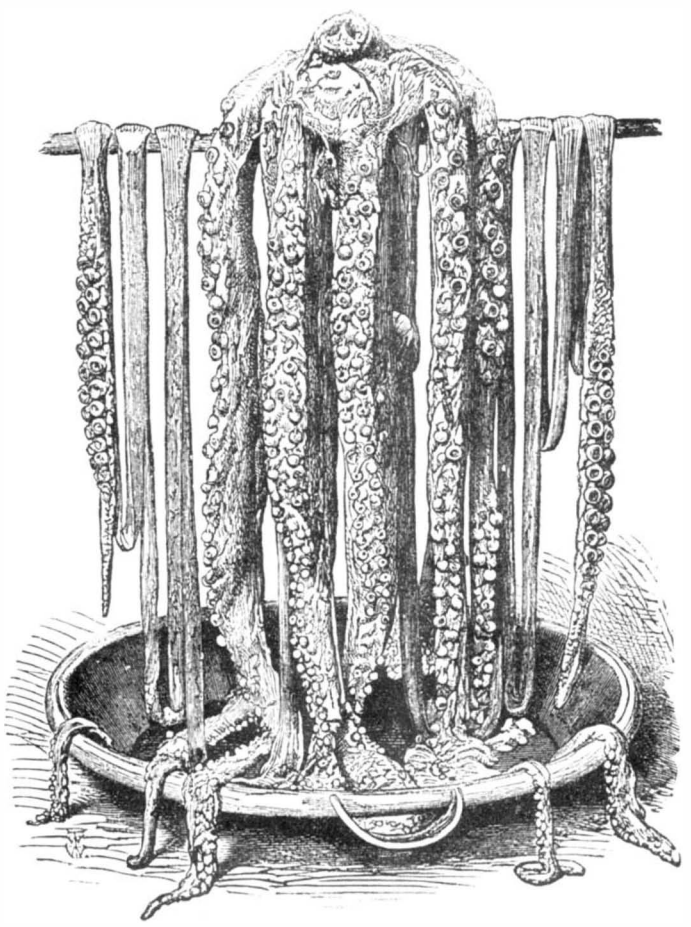
THE NEWFOUNDLAND DEVIL FISH.

Some weeks since we printed a letter from a correspondent in St. John's, Newfoundland, which was accompanied with a photograph, giving a description of a huge octopus or devil fish, found by some fishermen, entangled in their nets. We present herewith an engraving prepared from a photograph of this monster, which shows the head and arms with the beak in the center. The eyes are further back and do not appear. The nucleus is supported on a stand, and the eight short arms hang down with the suckers standing out prominently from the surface, the small ends resting in a round bath in which it had to be carried. A number of suckers are wanting in one arm, having been torn off in capturing the fish; the rest are perfect. At each side of the shorter arms the two long tentacles, 24 feet each, rest on a pole over which they have been doubled several times, their terminations, covered with large and small suckers, hanging down at the extreme right and left of the picture.

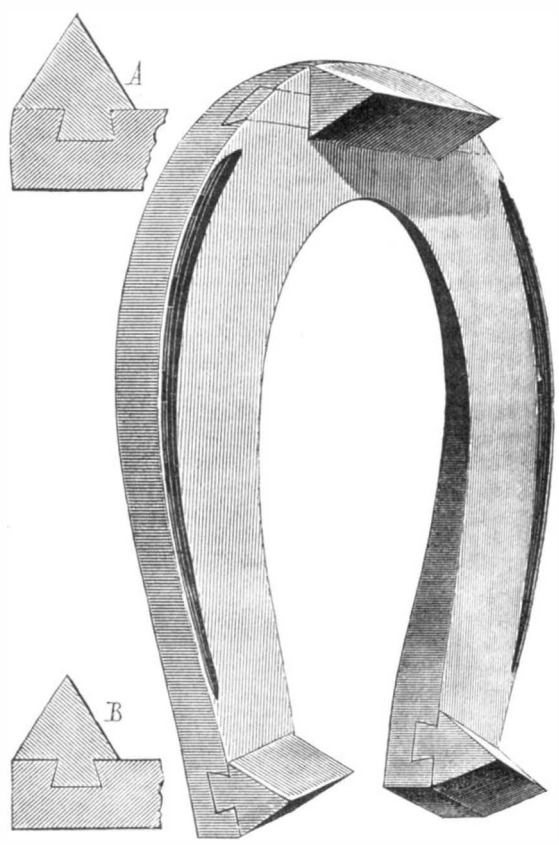
It is said that even this enormous creature is small beside some which infest the northern coasts of this continent, and of which trustworthy accounts are in existence. The terrible fate of any victim which may come within its clutches can well be imagined. Each of the short arms carries one hundred suckers; and the moment one of them touches the prey, the fish feels the contact and draws back a membranous piston. A vacuum is created and the edges of the disk are pressed against the surface of the victim with a force equal to the weight of the atmosphere added to that of the water above. The more the victim writhes, the more does it come in contact with other disks, each of which adheres; other arms soon encircle it, bringing it within reach of the powerful beak. "No fate could be more horrible," says a writer, in concluding a very graphic description of the monster, "than to be entwined in the embrace of those eight clammy, corpse-like arms, and to feel their folds creeping and gliding around you, and the eight hundred disks with their cold adhesive touch gluing themselves to you with a grasp which nothing could relax, and feeling like so many mouths devouring you at the same time. Slowly the horrible arms, supple as leather, strong as steel, cold as death, draw the prey under the fearful beak and press it against the glutinous mass which forms the body, and then, as the victim is paralyzed with terror, the powerful mandibles rend and devour." We doubt if the most depraved opium eater, in those terrible stages of delirium which succeed the delightful dreams induced by the drug, could imagine anything much more dreadful than such a death.



THE NEWFOUNDLAND DEVIL FISH.

BARNUM'S REMOVABLE HORSESHOE CALK.

Mr. John D. Barnum, of Amenia Union, Duchess county, N. Y., has invented a new removable calk for horseshoes, which, judging from the reports of its actual use, would seem to be a valuable and useful article. Its object is, while affording a sure footing to the animal on icy pavements, to economize in horseshoes and time; for instead of shifting shoes when the calks become worn out, it is only necessary to knock out the calks themselves, and very easily insert a new set. No especial shoe is needed, as all that is required to adapt the ordinary form to the device is the cutting of three grooves, one at either end and one near the toe, as shown in the annexed engraving. These grooves are made slightly tapering, and receive the dovetail tenon on the calks, as shown in the sections, A and B. The calk is attached by entering the small end of the tenon in the groove and then driving it tightly in. The projecting extremity of the tenon is then struck up or hammered smooth against the outer side of the shoe, forming a tight clinch.



When the calk has been worn and requires removal, it is only requisite to straighten out the clinched portion of the tenon and drive it out of the groove, when another calk may be inserted. Proposals regarding the investment of capital for manufacture, and inquiries for further information, should be addressed to the inventor as above.

Improvements in Concrete Construction.

A paper was recently read before the Institution of Civil Engineers, London, by Mr. Bindon Blood Stoney, C. E., "On the Construction of Harbor and Marine Works with Artificial Blocks of Large Size."

The author described a new method of submarine construction, with blocks of masonry or concrete far exceeding in bulk anything hitherto attempted. The blocks were built in the open air on a quay or wharf; and after from two to three months' consolidation, they were lifted by a powerful pair of shear legs, erected on an iron barge or pontoon. When afloat, the blocks were conveyed to their destination in the foundations of a quay wall, breakwater, or similar structure, where each block occupied several feet in length of the permanent work, and reached from the bottom to a little above low water level. The superstructure was afterwards built on the top of the blocks in the usual manner by tidal work. By this method the expenses of cofferdams, pumping, staging, and similar temporary works were avoided, and economy and rapidity of execution were gained, as well as massiveness of construction, so essential for works exposed to the violence of the sea. There was now being built in this manner an extension, nearly 43 feet in hight, of the North Wall Quay in the port of Dublin. Each of the blocks which composed the lower part of the wall was 27 feet high 21 feet 4 inches wide at the base, 12 feet long in the direction of the wall, and weighed 350 tuns. The foundation for the blocks was excavated and leveled by means of a diving bell, the chamber of which was 20 feet square and 6½ feet high. When the men were at work, the bell rested on the bottom. A tube or funnel of plate iron, 3 feet in diameter, rose from the center of the roof of the bell to several feet above high water level. An air lock in the top of this funnel afforded a passage up or down, without the bell having to be lifted out of the water. The material excavated was cast into two large trays, suspended by chains from the roof of the bell; when these were filled, the bell was lifted a few feet off the bottom, and the bell barge was drawn a short distance away from the line of the wall, where the stuff was discharged, by tilting the trays, and the bell returned to its work again. The hull of the floating shears was rectangular in cross section, 48 feet wide and 130 feet long. The aft end formed a tank, into which water was pumped to balance the weight of the block suspended from the shears at the bow of the vessel. The shear legs were rectangular tubular pillars of plate and angle iron, with a cross girder resting on the top; above this girder there were two sets of pulleys, through which were reeved the lifting (pitch) chains, formed of one and two flat links alternately. There were eight parts to each chain, or sixteen parts altogether, so that each part had to support, theoretically, one sixteenth of the suspended block. The inner ends of the chains passed down to the deck, where they were controlled by a pair of powerful crab winches driven by a 14 horse power steam engine, which also worked a centrifugal pump for filling or emptying the tank. The slack of the chains, after passing through the crab winches, was led under the deck, and was coiled up in the engine room over fixed pulleys by two donkey engines. When paying out chain, the donkey engines were thrown out of gear, and the crab winches on deck hauled up the slack according as it was wanted. Two cast iron girders were built into the bottom of each block, and at the end of each girder there was a rectangular hole. Four vertical tubes were built in the block over these holes in the girders, and the suspending bars were lowered from above and turned at right angles, so that their ends, which were T shaped, caught beneath the girders. The upper ends of the suspender bars were also T shaped, and were attached in a similar manner to the lower sets of pulleys, through which the lifting chains were reeved. When a block was set in place, the suspender bars were turned back 90°, and withdrawn for further use. Each block had vertical grooves left in the sides; and when two blocks were in place, these grooves formed a tube 3 feet square. A mass of concrete was subsequently thrown into the grooves, to act as a key or dowel between block and block; this completely plugged up the joints, which were only about ¼ inch open on the face.

The paper also contained a description of an annular block of concrete 19 feet in diameter, weighing 80 tuns, which the author constructed for the base of a beacon tower, in the year 1863, and conveyed two miles down the Liffey, where it formed its own cofferdam, in water 5½ feet deep at low spring tides. The water was pumped out by hand pumps, and the ground inside excavated, concrete being placed on the top of the ring as it sank, like the brick wells in India or the shafts of the Thames Tunnel.

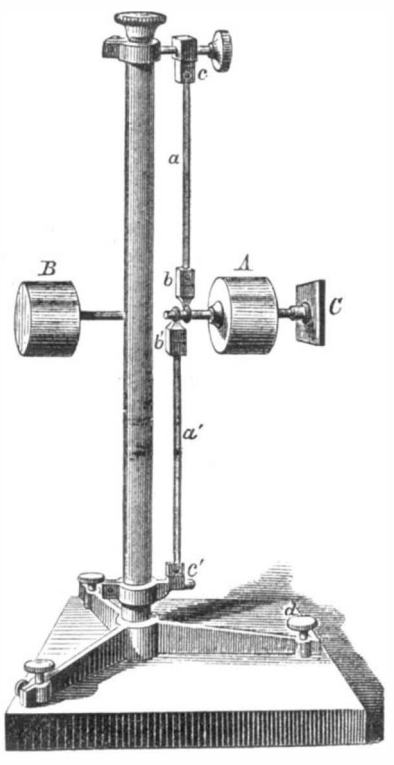
The method of making concrete and mortar, adopted by the author, differed in some respects from that in ordinary use. He preferred a rapid mixture of the ballast or sand with cement or lime to the slow triturating process of the mortar pan with edge runners. The concrete mixer, devised by him, driven by a 3 horse power engine, would turn out from 10 to 12 cubic yards per hour. The mixer was a fixed horizontal or inclined trough, open on the top, with a longitudinal axis, having stout iron blades at short intervals which, as they revolved simultaneously, pugged the materials and screwed them forward. The water was let on gradually through a rose, and the first few blades incorporated the materials in a dry state before they reached the water.

The author believed the application of the new system of gigantic blocks to the construction of breakwaters would, in many cases, be cheaper, more rapid, and more permanent than the ordinary methods of construction.

Zollner's Horizontal Pendulum.

M. F. Zöllner communicates to the English *Philosophical Magazine* a paper on the origin of the earth's magnetism and the magnetic relations of the heavenly bodies, in which he describes a method by which he considers we are enabled to measure even those small forces which are, for instance, produced by the difference in distance between any point on the earth's surface from sun or moon and the distance of the earth's center of gravity, or by difference in the centrifugal force of two points at different distances from the earth's surface.

The apparatus is represented in the accompanying engraving; *a a'* are thin watch springs held in continual tension by the weight, *A*, with the mirror, *C*, in front. The stand is made of iron, and the feet of the tripod are as long as possible, in order to effect very small changes in position of the points of suspension with regard to the direction of gravitations by the slow movement of the screws. By means of the screw *d*, situated in a vertical plane passing through the two points of suspension, *c* and *c'*, the sensitiveness of the instrument may be governed, as by the relative position of the points, *c* and *c'*, the time of vibration of the horizontal pendulum is determined. A time of vibration of 30 seconds (half a period) is easily accomplished. *B* is a counterpoise of *A*. Before the oscillating mass, *A*, and the parts belonging to it were placed in the rings, which fit into small incisions cut into the cylindrical axis, it was set in vibration by the direct action of gravity round a knife edge occupying provisionally the place of the turning point. The time of oscillation amounted to nearly 0·25 of a second. By means of a known relation, the the ratios of moments of direction are thus easily obtained, which are exerted by gravity on the vibratory mass in the



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horizontal and vertical directions. The mirror attached to the end of the pendulum allows the reading off of the changes in the direction, according to the method of mirror reading, on a scale 10 feet 4½ inches distant from the mirror. With regard to the above mentioned time of vibration of 0·25 second, it was calculated that a 0·2539 inch division on the scale corresponds to a deviation of 0 0097063 second of an arc of an ordinary pendulum. The instrument is so extremely sensitive that deviations of only 0·001 second of an arc may be obtained even with a time of vibration of 14 44 seconds. A railway train at a distance of a mile has been found to set the instrument in operation.

Observations are best made in deep and quiet mines, where the variations of temperature and shakings of the earth are absent, and all those influences can, therefore, be determined quantitatively which are caused either directly by volcanic movements of the ground, or indirectly by magnetic induction, through changes in the velocity of the streaming masses on the inner part of the earth. Besides the generation of an inner tidal and pressure wave, the sun and moon exert a direct influence on the positions of the instrument, because they attract, with different intensity, the center of gravity of the earth and the center of gravity of the pendulum. We may thus expect to determine the magnitude on which these influences depend, by a much extended and statistically headed series of observations, that is to say, the masses and distances of sun and moon in units of the mass and radius of the earth.

Supposing the instrument set up in the meridian, the pendulum, if moving only under the influence of the sun, would pass, in twenty-four hours, four times through its position of equilibrium in the meridian—at sunrise, sunset, and at the upper and under passage of the sun through the meridian. As the movement of the pendulum is not an effect of summature, as that of the sea in the tides, but is generated directly by attractive action at a distance, it must take place simultaneously with the corresponding true position of the sun. But if gravity, as light, takes a time of about eight minutes in arriving from the sun to the earth, the above position of equilibrium would take place so much later. If, therefore, we only succeed in determining these positions to within one minute of accuracy, the question whether gravity needs time for its propagation could be decided even if this velocity were ten times that of light.

The discussion of observations made simultaneously in two vertical circles with the horizontal pendulum, and their comparison with the readings of magnetic instruments, will supply valuable material, tending to elucidate the causes of the close relation between the mechanical, electrical, and magnetic phenomena on our planet; the explanation of which will, perhaps, some day give us as clear a conception of the occurrences in the earth as the language of signs of the senses, chiefly by the help of light, has given us of the occurrences on its surface.—*Science Record for* 1873.

New Metallic Decorations.

At a recent meeting of the Royal Institute of British Architects, Mr. C. H. Cooke introduced to the profession a new style of decoration, recently perfected in Paris, and applicable to iron, brass, and zinc, which is expressed simply and plainly as "cut work."

The cutting of these metals was effected by a steam saw, the hardness and make of the saw being in reality the secret of the whole work; and this tool, as was shown by the various specimens which were exhibited, offered the greatest facilities for the conception and working out of the most intricate and delicate design obtained by any other means. The zinc work, it was believed, would stand in this country, as at Paris, the effect of the weather, without painting.

This method of cutting through hard metals has been brought to great completeness, and by it could be cut brass and copper three inches thick and wrought iron one inch thick. The face of the work could be chased or engraved as desired; and after the pattern required had been cut by the saw, it could be heated, and the twist to the ends or points, so frequent in wrought work, could be given, and certain portions of the ornamental work raised or depressed as desired; and this forms a combination in metal working hitherto unknown.

The cost was moderate, being more than a third less in cost than for the same kind of work in wrought iron as usually done. It was stated that this mode of working in metals offered a valuable opportunity for the operation of the architect. It would be idle to attempt to enumerate the various ways the work might be applied, for every architect and actual metal worker must be aware that it was almost unlimited in its applications.

TIN FOIL ORNAMENTATION.

Mr. Cooke also said that the printing on tinfoil, in imitation of wood or marble, was applicable to wall decoration, woodwork, and house furniture, and would be found on examination to possess many advantages. Some would, he knew, object to it as a sham, but they must have some sham; and for his part he looked upon this as very good, useful sham, especially when they could put this work upon damp walls, and decorate the surface at the same time; besides which, it offered great facilities for decoration in places where it was difficult to obtain skilled labor, and the case and skill with which it could be used would be specially valuable either on new buildings or temporary erections, and be a great boon to our colonists. For halls and staircases, it certainly would be much more effective and serviceable than paperhanging as now used. From the extreme thinness of the material, it was capable of enveloping the most delicate of moldings and the surface being varnished, and then placed in a hot chamber, and subjected to a heat of 120° Fah., it was considered permanent and durable. This work can be obtained in rolls two and three feet wide, and eighteen feet long.

The Mountains of the United States.

The following is the hight of the principal mountains in the United States, as compiled from Professor Hayden's Report, in the United States *Register*:

ROCKY MOUNTAINS, SIERRA NEVADA AND CASCADE RANGE.

	Feet.
Mount St. Elias, Alaska, (Est.)	15,860
Mount Fairweather, Alaska, (Est.)	14,783
Mount Whitney, California	15,000
Mount Shasta, California	14,442
Mount Rainer, Washington Territory	14,434
Mount Tyndall, California	14,386
Mount Harvard, Colorado Territory	14,270
Pike's Peak, Colorado Territory	14,216
Irwin's Peak, Colorado Territory	14,192
Gray's Peak, Colorado Territory	14,145
Mount Lincoln, Colorado Territory	14,124
Mount Yale, Colorado Territory	14,081
Long's Peak, Colorado Territory	14,050
Mount Brewer, California	13,886
Mount Hayden, Wyoming Territory	13,858
Horse Shoe Mountain, Colorado Territory	13,806
Silver Heel's Mountain, Colorado Territory	13,650
Fremont's Peak, Wyoming Territory	13,570
Mount of the Holy Cross, Colorado Territory	13,500
Mount Hodges, Uintah Mountains	13,500
Mount Tohkwano, Uintah Mountains	13,500
Velie's Peak, Colorado Territory	13,456
Mount Audubon, Colorado Territory	13,402
Gilbert's Peak, Uintah Mountains	13,250
Mount Dana, California	13,227
Mount Lyell, California	13,217
Mount Guyot, Colorado Territory	13,223
Parry's Peak, Colorado Territory	13,133
Three Teton's, Idaho Territory	13,000
Bald Mountain, Idaho	13,000
Mount Flora, Colorado Territory	12,878
San Francisco Mountains, Arizona Territory	12,052
Wahsatch Mountains, Utah	12,000
Spanish Peaks, Colorado Territory	12,000
Mount Englemann, Colorado Territory	12,000
Snow Line, 41° North Latitude.	
Mount Wright, Colorado Territory	11,800
Mount Silliman, California	11,623
Mount San Bernardino, California	11,600
Mount Hood, Oregon	11,225
Mount Pitt, Oregon	11,000
Lone Peak, Utah Territory	11,000
Black Hills, Wyoming Territory	11,000
Wind River Mountains, Wyoming Territory	11,000
Electric Peak, Yellowstone Park	10,992
Mount Baker, Oregon	10,719
Emigrant Peak, Montana Territory	10,629
Lassen's Butte, California	10,577
Mount Sheridan, Wyoming Territory	10,420
Mount Washburn, Yellowstone Park	10,388
Ward's Peak, Montana Territory	10,371
Mount Delano, Montana Territory	10,200
Mount Blackmore, Montana Territory	10,134
Mount Doane, Yellowstone Park	10,118
Mount San Antonio, California	9,931
Mount St. Helen's (Volcano), Washington Territory	9,760
Old Baldy, Montana Territory	9,711
Mount Garfield, Idaho Territory	9,704
Mount Adams, Washington Territory	9,570
Bridger's Peak, Montana Territory	9,000
Crater Lake, Cascade Range, Oregon	9,000
Mt. Olympus (Coast Range), Washington Territory	8,136
Yellowstone Lake, Wyoming Territory	7,788
Mount Mitchell, Allegheny Mountains, N. Carolina	6,732
Mount Washington, White Mountains, N. Hampshire	6,285

PASSES OVER THE ROCKY MOUNTAINS.

	Feet.
32d Parallel, near El Paso	5,714
35th Parallel, near Albuquerque	7,472
38th Parallel, (Coochecopa Pass)	10,000
41st Parallel, (Union Pacific Railroad)	8,241
42d Parallel, (South Pass)	7,085
47th and 48th Parallels, (Cadott's Pass)	6,044
47th and 48th Parallels, (Deer Lodge Pass)	6,200
47th and 48th Parallels, (Lewis & Clark's)	6,323
Flathead Pass, (Northern Montana)	5,459
Kutanie Pass, (British America)	6,000

PASSES OVER THE SIERRA NEVADAS.

	Feet.
Tejon Pass, 34° 45′ North Latitude	5,250
Walker's Pass, 35° 30′ North Latitude	5,300
New Pass, to Owen's River	3,164
Mono Pass, to Mono Lake	10,700
Silver Mountain Pass, to Carson City	
Donner Pass, (Central Pacific Railroad)	7,042
Beckwith's Pass, to Pyramid Lake	4,500
Truckee Pass	7,200
Lassen's Pass, (40° 35′ North Latitude)	
Madelin Pass	5,667

P. suggests that a waterproof sizing or glazing be used in the manufacture of paper collars, so that they can be cleansed by wiping them with a moistened cloth.

Dyeing and Coloring Natural Flowers.

"Painting the lily" is generally considered about the acme of useless performances, but a correspondent of the *Garden* in the following lines tells us how to do it. The idea, of course, is not to improve on Nature's handiwork, but simply to prepare the flowers so that they will keep for an indefinite length of time, and, when arranged in bouquets, form handsome ornaments. The process, it will be seen, may also be applied to grasses and mosses with very good effect.

Dyeing is especially used for the red *xerranthemum annuum fl. pl.*, red asters, and all kinds of ornamental grasses. Mix ten parts of fresh water with one part of good nitric acid, plunge the flowers in, shake off the liquid, and hang them up to dry. In this way xerranthemums, which should be cut when entirely open, will acquire a beautiful bright red tint; while grasses only become a little pale red on the tops, but will keep afterwards for many years, and may, if needed, be colored otherwise at any time. Asters generally, when treated in this way, are not so fine as if dried in sand, or smoked with brimstone. To color flowers and grasses blue, violet, red, scarlet, and orange, use the different kinds of aniline; for yellow use picric acid, and for bright scarlet use borax. The aniline dye should be dissolved in alcohol before it is fit for use, in which condition it should be kept in well closed bottles until it is required. It may also be purchased in a dissolved condition of any respectable chemist. To color by means of aniline, take a porcelain or any other well glazed vessel, pour in some boiling water, and add as much dissolved aniline as will nicely color the water. According to the quantity of aniline used, the color of the flowers will become more or less bright. After the water has cooled a little, plunge in the flowers or grasses, and keep them in it till they are nicely colored; then rinse in cold water, shake off the liquid, and hang them up in the open air to dry. To obtain a fine blue, take aniline *bleu de lian*, boil the color with the water for five minutes, and then add a few drops of sulphuric acid before using. For violet, use one part aniline violet and one part of aniline *bleu de lian*; for red, aniline fuchsin; for scarlet, one part of aniline fuchsin and one of aniline violet; for orange, aniline *d'orange*; for lemon color, picric acid, which should be dissolved in boiling water and then thinned with a little warm water. Dip in the flowers, but do not drain off the liquid. All kinds of ornamental grasses can be thus colored, especially *stipa pennata* and *ammobium alatum*, white xerranthemums, and most other everlasting flowers. *Immortelles*, however, as well as the other kinds of helichrysums, must be treated differently; their natural yellow color must first be extracted by dipping them in boiling soap water, made with Italian soap, and afterwards dried in an airy, shady place. The flowers generally become closed when thus treated, and should be placed near an oven and subjected to the influence of a dry heat, when they will soon re open. This is very important if they are intended to be colored; if not, they will remain fine pure white immortelles. Most immortelles, however, are colored bright scarlet by means of borax, which gives a beautiful color; but it does not keep well, and becomes gradually paler. For this purpose, dissolve as much borax in boiling water as will color it nicely; when cool, dip the flowers, but do not allow them them to remain in after they have taken the color; if kept in too long, they will not again open their flowers. The chief point in every mode of coloring immortelles is to place them first in a dry, warm atmosphere, where they will open their flowers well; and, after coloring, they should again be exposed to heat, by which means they will nearly always reopen them. Very nice looking immortelles are also produced by coloring only the center of each flower scarlet, which is done very rapidly with borax, by means of a small pencil or a thin wooden splinter, which is dipped into the color and afterwards applied to the center. This is generally done by little children in those establishments in Germany and France which supply the trade with everlasting flowers. The following is a very cheap and very good recipe to color ornamental grass and moss a beautiful green: If a dark green is required, take two parts of boiling water, one ounce of alum, and half an ounce of dissolved indigo carmine; plunge the moss or grass into the mixture, shake off the liquid, and dry the grass or moss in an airy, shady place. In the winter, however, they should be dried by means of fire heat. If a light green is required, add to the above mixture more or less picric acid, according as a more or less light shade is required.

Copper Alloys and Ores.

Dr. Percy, in a recent lecture at the Royal School of Mines on the above subject, said:

You must have observed the iron railings of London. Where the iron is in immediate contact with the lead at the bottom, there corrosion takes place to the greatest extent. When two metals are brought together—say, zinc and copper—they rust on exposure to air and moisture, but one of them serves to protect the other from rusting. To prevent the corrosion of the copper on ship bottoms, Sir Humphrey Davy recommended that pieces of zinc should be placed in contact with the copper: by that means the corrosion of the copper was prevented, but the zinc corroded and wasted very rapidly. Since that time the Admiralty have had some more precise experiments made on this subject, and it has been found that, when in contact, lead promotes the corrosion of copper, and copper promotes the corrosion of iron.

What takes place when copper and lead are melted together (say) at temperature of melting point? Will they alloy—that is, remain permanently united when the metal has become cold, as in the case of common brass, a compound of spelter and copper? Suppose I take a quantity of copper

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and melt it, and add thereto an equal weight of lead and mix the whole together thoroughly; then if I take out the mixture and cool it rapidly, I get an ingot composed of copper and lead, almost wholly in mechanical mixture. Suppose, instead of cooling it rapidly I leave it to cool slowly; an almost complete separation of the two metals takes place; the lead, being the heaviest of the two, accumulates at the bottom of the mold. The separation in this latter case is not perfect, for the copper will retain about 2 per cent of lead, and the lead also about that percentage of copper. There is, therefore, no proper alloy of these metals in the strict sense of the term.

Next let us take copper and iron, and the iron we use will be that which is most like pure iron—wrought iron. Suppose we expose the mixture of copper and iron to a very high temperature; we shall not get anything but a mechanical mixture; when the proportion of the iron increases beyond a certain degree, we can distinguish under the microscope small grains of that metal, diffused through the mass. Iron is a white metal, and copper a red one. In every other case that I know, when two metals differing in color form a true alloy, the product differs in color from either of the metals, but in the case of this mixture of iron and copper, the product is a ruddy colored mixture like copper, the iron being diffused through it. That is to my mind a satisfactory proof that it is a mechanical mixture, and not a true alloy. To get this mixture in the best manner, take some oxide of iron and oxide of copper, as fine as possible, and mix them up intimately with some finely powdered charcoal, and then subject the mass to a high temperature; the charcoal, as we know, will then reduce both the oxides, and set free the metals in a condition most favorable for their combination.

Metallic copper or native copper is frequently found in connection with other copper ores; sometimes in vast masses, as near Lake Superior, where it was said there was one mass of copper in the metallic state weighing not less than 500 tuns. In this condition it is, perhaps, one of the most expensive ores of copper, for the metal is excessively tough, and cannot be blasted, but must be prepared for the market by being cut up with tools. The next ore is the oxide of copper; there are really two oxides of copper, the red and the black, and they are among the richest ores of copper. Then we have the blue and green carbonate; the latter is commonly called "malachite" and is frequently applied to ornamental purpose. These latter ores are compounded of oxide of copper, carbonic acid, and water; and when heated up to a good red heat, they lose water and carbonic acid, and the residue consists of oxide of copper. In treating an ore of this kind, then, we may consider ourselves, therefore, as virtually treating an oxide of copper. There is another class of ores in which copper is combined with sulphur; one exactly similar in all respects to that compound I have before described—the gray sulphide of copper, an extremely valuable ore. Then there is another in which iron occurs as a constituent—common yellow ore or copper pyrites; it consists of copper and iron, and sulphur. Sometimes copper pyrites is mistaken by inexperienced persons for iron pyrites, a compound of iron and sulphur, which is far less valuable than the other, but here is a simple test by which you can infallibly distinguish between them. Apply the point of a penknife in the case of copper pyrites, you can scratch it easily; but in the case of iron pyrites, yon can make no mark upon it.

CHEMICAL NOTES.

Action of Heat on Gases and Vapor Condensed by Charcoal.

When wood charcoal, saturated with dry chlorine, is placed in the longer branch of Faraday's siphon gas-condensing tube, and the heat of boiling water is applied to it, the shorter branch being placed in a freezing mixture, a portion of the gas is volatilized. Pressure being thus developed, liquefied chlorine soon appears in the tube. The experiment is well adapted for a lecture demonstration. The author has liquefied in this manner ammonia, sulphur dioxide, hydrosulphuric acid, hydrobromic acid, ethyl chloride and cyanogen.

Wood charcoal retains so firmly the vapors of the volatile liquids, bromine, hydrocyanic acid, carbon sulphide, ether and alcohol, that, upon repeating with them the experiment just described, no liquid is obtained.

Pouillet observed a slight evolution of heat when water, oils, ethyl acetate, and alcohol were absorbed by mineral powders, and still more marked effects with organic powders. The author finds that, with charcoal, still more heat than in the above case is given out when it absorbs liquids upon which it has, apparently, no chemical action. Thus with 5—10 grains of charcoal, and 40—80 grains of bromine, the temperature was raised 30° C. If the charcoal had been previously heated to expel gas, and then cooled *in vacuo*, the absorption of bromine being also conducted *in vacuo*, no doubt the rise of temperature would have been still greater. —*Melsens, Comptes Rendus—Journal of the Chemical Society.*

Sugar from Caoutchouc.

Caoutchouc from Madagascar yields a saccharine substance, which A. Girard has named "matezite," from the native word for caoutchouc. Matezite is white, very soluble in water, less soluble in alcohol, from which it crystallizes in tufts. It melts at 181° to a vitreous mass, which does not crystallize on cooling, and may be sublimed at 200°—210° without decomposition. It deposits in drops. Its formula is $C_{10}H_{20}O_9$; and on treatment with hydriodic acid, it undergoes a decomposition analogous to the others, forming a sugar called by the author *matezodambose*.

Glycyrrhizin, or Liquorice Juice.

P. Griessmayer says: "It has been suspected that sugar, extracted from liquorice root, has been used for the purpose of adulterating beer, and yet the opinion of chemists has been that such sugar is not fermentable. Glycyrrhizin is a glycoside, which, on boiling with acids, decomposes into glycyrretin and sugar. Even after boiling it with water, sugar may be detected by Fehling's test. The sugar obtained in this manner was treated with yeast, and after three days the fermentation was complete, and alcohol was found in large quantity by means of the well known reaction converting it into iodoform. During the latter stage of the fermentation a peculiarly disagreeable putrid odor was perceived, and the substance emitting it passed over into the distillate; the disagreeable taste of some German beers is doubtless owing to this body.—*Dingler's Polytechnisches Journal.*

Amylammonium Chloride.

Amylammonium chloride, introduced under the skin of the rabbit, guinea pig, and dog, causes, in small doses, a marked diminution of the pulse, and some fall in temperature. In larger doses convulsions are produced, which end in death. With man a dose of from 8 to 16 grains lowers the pulse 10 to 20 beats per minute, and occasions a fall in temperature. Dr. Dujardin-Beaumetz has administered this salt with advantage in some cases of typhoid fever. Amylamine has not the sedative action on the nervous system which trimethylamine possesses, but surpasses it greatly in its effect on the pulse, and in its toxic action.

Experiments on the Preservation of Eggs.

F. C. Calvert finds that eggs, either entire or pierced at the end by a fine needle, may be kept for three months without change in an atmosphere of nitrogen, hydrogen, or carbonic anhydride. In dry oxygen entire eggs undergo no change, but if the gas is moist the egg becomes covered with a white filamentous mold.

An egg pierced at the extremity soon becomes putrid either in dry or in moist oxygen, the amount of oxygen consumed, and of carbonic anhydride and nitrogen evolved, being much greater in the latter case than in the former.

New laid eggs immersed in weak chlorine water contained in a stoppered bottle underwent no change for nearly eight months, but on leaving the bottle open for a week, they became covered with *penicillium glaucum*.

Eggs kept in a weak solution of chlorinated lime soon began to show signs of change externally by the growth of penicillium. With lime water and with calcium sulphite, similar results were observed.

Eggs kept in solution of phenol exhibited no change for three months. They were then slightly coated with penicillium, but their contents were perfectly sweet.

Camphor for Seeds.

According to A. Vogel, camphor is found to have a marked effect in stimulating the germination of seeds, both by shortening the period of germination and causing more seeds to sprout. Turpentine has a similar action, but seems to exert a hurtful influence on the further development of the plant, which is not the case with camphor.

The Costly Mistakes of Civil Engineers.

President White, of Cornell University, makes the following strong assertion in a recent lecture:

"Another great department bearing on a multitude of industries, directly and indirectly, is civil engineering. Take one among the fields of its activity. We have in the United States about 70,000 miles of railway, and every year thousands of miles are added. I do not at all exaggerate when I say that millions of dollars are lost every year, by the employment of half educated engineers. Proofs of this meet you on every side. Lines in wrong positions, bad grades, and curves, tunnels cut and bridges built which might be avoided. All of us know the story. But this is not all. Hardly a community which has not some story to tell of great losses entailed by bad engineering in other directions. Here it is the traffic of a great city street interrupted for a year because no engineering can be found able to make the calculations for a 'skew arch' bridge, a thing which any graduate of a well equipped department of engineering can do; there it is a city subjected to enormous loss by the failure of its water supply system because the engineer employed made no calculation for the friction of water in the pipes; in another instance it is a whole district sickened by masma, because a half taught engineer was entrusted with its drainage. We must prepare men for better work; and for every dollar thus laid out, we shall create or save thousands. Nay, we shall save lives as well as money. Mr. Baldwin Latham, in his recent book on "Sanitary Engineering" and Dr. Beale, in his work on "Diseased Germs," show by statistics that a proper application of engineering to sewerage would save one hundred thousand lives yearly in Great Britain alone, and the same truth holds in this country."

One Hundred and Twelve Miles an Hour on the Ice.

The Poughkeepsie *Eagle* gives an interesting account of an example of such movement, which recently took place on the Hudson river at Poughkeepsie. "The wind blew very fresh from the south, and the owner of the new ice boat Cyclone determined to take advantage of the favorable opportunity for timing his yacht. The Hudson at this point is very wide, and at the course selected its breadth is one mile. Having made every preparation for the feat to be accomplished, the reef points were shaken out of the sails, and every stitch of canvas spread to the gale. With two men on the windward runner to keep the boat down to the ice, the helm was turned, the sails filled, and in a moment, with every inch of canvas drawing, she was under full headway. Like an arrow from a bow she darted away on the course, clouds of pulverized ice following in the track of her runners as they hummed over the surface of the river, and in what seemed but an instant the river had been crossed and the mile accomplished in the almost incredible time of thirty-one seconds, being at the rate of two miles in a minute and two seconds, or 112½ miles per hour. Persons on shore compared the speed of the flying racer to that of a meteor flashing through the sky, and watched her movements with eager interest. The owner afterward put the boat through some movements on the ice, and astonished the lookers-on by sailing all the way across the river on one runner, the force of the wind throwing her over on her beam ends and raising the windward runner from ten to twelve feet above the ice. Although but few were found willing to partake of the amusement, all seemed disposed to coincide in the opinion that ice yachting is the most exhilarating of sports, and the evolutions of which one of these yachts is capable, the most graceful of anything they had ever witnessed."

We have in various articles in the back volumes of the SCIENTIFIC AMERICAN illustrated and described the philosophy which governed the movement of ice boats, and have pointed out the reasons why they were frequently driven at a considerably higher velocity than the speed of the wind by which they were propelled. But we think the above statement of velocity needs further verification.

Allowing that the breeze which propelled the boat was a high wind, its velocity could not have exceeded thirty-five miles per hour, while the boat moved at the rate of one hundred and twelve and a half miles per hour, which is faster than a tornado. The wind of the latter reaches a velocity of one hundred miles an hour, pressing with a force of fifty pounds to the square foot upon whatever object it touches, sweeping away buildings and trees in its fearfully rapid progress.

Correspondence.

Harmonic Law of the Planetary Distances.

To the Editor of the Scientific American:

Permit me, through your valuable paper, to publish to the world a new harmonic law existing between planetary distances and motions. It is superior to Kepler's third law, which, although only an approximation, has been the basis of all theoretical astronomy for the last two hundred and fifty years. The following will be found mathematically exact:

The square root of the quotient arising from dividing the distance of any exterior planet by the distance of any interior planet, multiplied by the velocity of the exterior planet, shall equal the velocity of the interior planet. I give the last corrected figures of planetary distances and motion, so that any one, acquainted with the first rules of arithmetic, can work the problem, proving the existence of this beautiful and exact law, another signature of the Omniscient Almighty:

	Mean distances in miles.	Mean motion per hour.
Mercury.....	35392638	105 (thousand +) 330 miles.
Venus.....	66191478	77 " 050 "
Earth.....	91430220	65 " 533 "
Mars.....	139312226	53 " 090 "
Jupiter.....	495693149	27 " 744 "
Saturn.....	872134583	21 " 221 "
Uranus.....	1753851052	14 " 963 "
Neptune.....	2746271232	11 " 958 "

Kingstown, Ind. ALFRED LUTHER.

REMARKS BY THE EDITOR.—Our correspondent should communicate his results to Professor Daniel Kirkwood, of Bloomington, Ind., who is called by Mr. Proctor the "Kepler of Modern Astronomy." Kepler's laws are as follows:

1. Each planet describes round the sun an orbit of elliptic form, and the center of the sun always occupies one of the foci. 2. The areas described by the radius vector of a planet, round the solar focus, are proportionate to the time taken in describing them. 3. The squares of the times of revolution of the planets round the sun are proportional to the cubes of their major axes. The search for this last law (which applies to the satellites also) cost Kepler 17 years' calculation. Harmonic relation appears throughout the universe. Overtones in music, the formation of crystals, *phyllotaxis* or the arrangement of leaves around the stem, all show most curious numerical relations. The lines of fluted spectra of the first order are supposed to be successive harmonics of a single motion in the molecules of luminous gas. Perhaps these harmonic laws may yet teach us, beside the distances of planets, the distance of atoms and the size of the molecule.

Charcoal for Wounds, etc.

To the Editor of the Scientific American:

The best simple remedy I have found for surface wounds, such as cuts, abrasions of the skin, etc., is charcoal. Take a live coal from the stove, pulverize it, apply it to the wound and cover the whole with a rag. The charcoal absorbs the fluids secreted by the wound, and lays the foundation of the scab; it also prevents the rag from irritating the flesh, and it is antiseptic.

If, however, you prefer a white scab to a black one, use quinine instead. This possesses all the virtues of the charcoal, and is, besides, astringent and tonic. P.

HACHISCH.—M. Naquet has lately been studying the physiological action of hachisch. The extract of hemp seed (*cannabis indica*) administered to various persons produces a great exuberance of ideation; it is not new ideas, but the exaggeration, amplification, and combination of ideas which pre-existed in the person's mind. Hachisch produces one curious effect (which is also observed in acute mania); this is a singular inclination to make puns and plays upon words.

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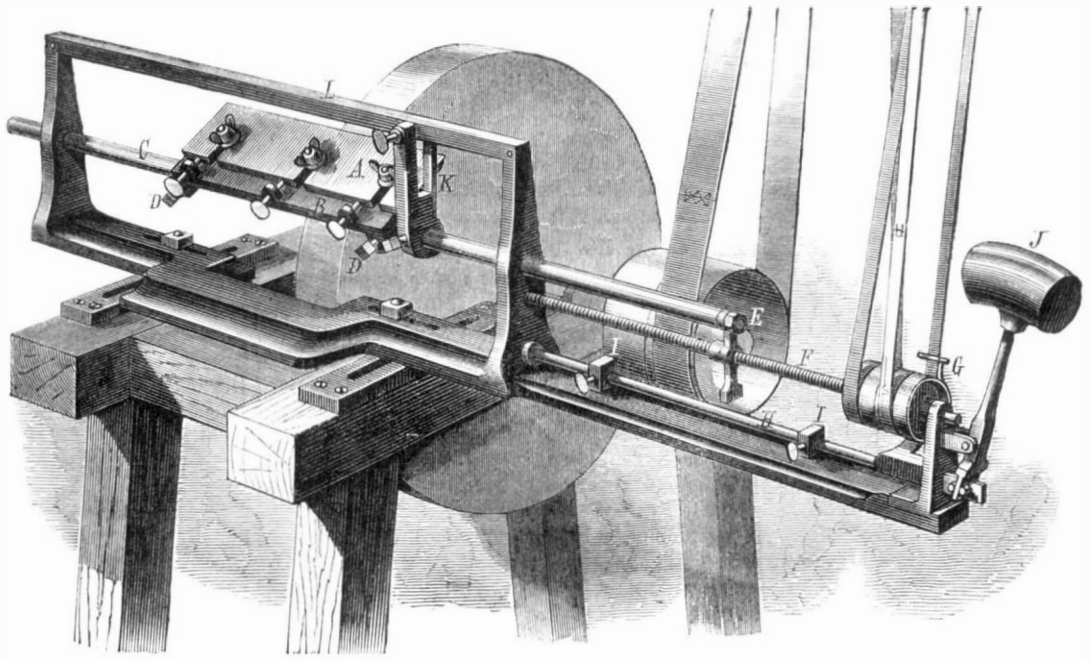
IMPROVED AUTOMATIC TOOL GRINDING MACHINE.

It is hardly necessary to point out to any mechanic who has ever sharpened a tool, either by hand or by the aid of mechanical apparatus, in connection with the grindstone, that the main difficulty to be overcome is the securing of a perfectly true straight edge. Without entering into the relative merits of the various devices which have been invented in order to attain this object, we desire, in the following description, to call attention to an improved machine, which is claimed not only to grind long cutting edges perfectly straight, or to a perfect curve, but to perform its work automatically without necessitating skilled care. It is also so constructed as to obviate the jumping of the knife on the stone, while its effect upon the latter is to keep it truly round and square on the face.



AUTOMATIC TOOL GRINDING MACHINE.

In our engraving the blade, A, which may be a tobacco, leather, paper, or planing machine knife, or in fact, any other cutter of a length within the limits of the frame, is secured to a tool holder, B. The latter has on its lower side projections through which passes the long rod, C. By means of the set screws at D, the tool holder, B, after being set at any desired angle, may be rigidly clamped to the rod, C, while the knife blade is secured and adjusted on the tool holder by means of the clamping screwr shown thereon.

The rod, C, extends through one of the upright standards of the frame, and carries on its end an arm, E, in which is a nut through which passes the feed screw, F. The latter has near its end four pulleys, two of which are fast and two (the inner ones) loose. The bands of these pulleys are arranged with a simple shifting apparatus, so that only one belt on the fast wheels can be in action at a time, the other belt slipping to the adjacent loose pulley. As the belts, as will be seen from the engraving, are arranged so as to communicate motion in relatively opposite directions, it is evident that, by the means above described, the feed screw may be caused to revolve in either way at will. Communicating with the shifting device, part of which is represented at G, is a stop rod, H, on which are shown two sliding collars, I. The rod, H, slides in its bearings, and is connected to a moving weight or counterpoise, J.

From the above it will be clear that, as the proper pulley is rotated, the feed screw turns, for example, so as to carry the nut on the arm, E, forward, and consequently the tool holder and blade on the rod, C. This motion continues until a downward projection on the arm, E, strikes the forward stop, I, carrying the same along with it and thereby moving the stop rod, H. The latter pulley on the lower part of the counterpoise lever throws the weight over to the right, and, at the same time, thus shifts the belts to the other pair of pulleys, giving to the feed screw a contrary motion. The result is that the knife is drawn along the face of the stone in the opposite direction until the other stop is encountered, the rod moved, belts shifted, and the same operation repeated.

Just to the right of the tool holder is an arrangement which constitutes one of the most important features of the machine. It consists of a sliding piece on the rod, C, to which is attached, at K, a metal spring which bears against the pattern bar, L. This piece is rigidly clamped to the rod, C, by a suitable set screw, and is therefore carried along with it. The action of the spring, as a moment's consideration will show, is to bear the tool against the stone to the exact point desired, while holding it rigidly to give sufficient play to avoid the jumping or jarring of the tool against inequalities of the surface. Hence, no matter how irregular the shape of the stone, the blade is constantly held against all points of its periphery.

We have already shown how the angle of the blade is adjusted. The amount to be ground away can also be limited by set screw attached to the spring carrier, which, as represented, takes against the pattern bar, L. This device prevents any damage to the tool through inattention, as the machine will only allow the grinding to continue to the bounds fixed by the screw. By using a properly curved pattern bar to suit the shape of knife, blades of peculiar form may, through the operation of the spring arrangement, be ground with perfect curves.

The mode of attaching the machine to the grindstone by the bolts and slotted plates, so as to allow of still further adjustment, is clearly indicated in the illustration. Three sizes of the machine are made to suit various lengths of blades, and also an extra smaller form for use with the common hand grindstone. No honing, we are informed, is necessary after the tool has once been properly ground with the device. Further particulars may be obtained by addressing Mr. E. Conner, general agent, No. 95 Liberty street, New York city.

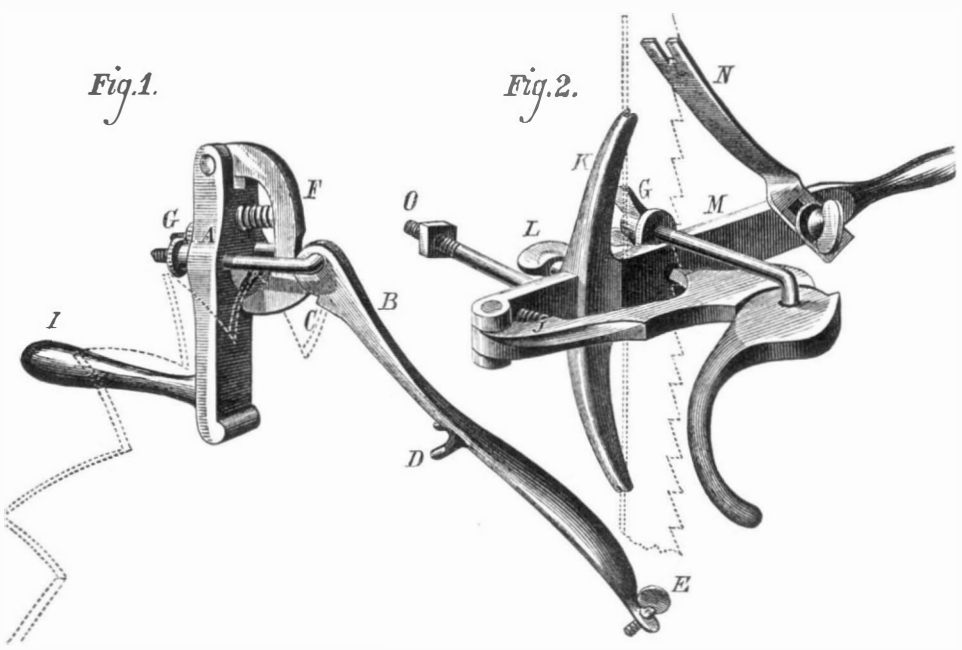
Chloride of Gold for Toning.

At a meeting of the photographic section of the American Institute, Mr. H. J. Newton, the President, gave the following description of his method of making chloride of gold:—

I take two drams of nitric acid and three drams of hydrochloric acid; in that I dissolve a five dollar gold piece. That is pure enough; the copper is an advantage rather than a detriment. In this way you have 135 grains of gold. Reduce that so as to have eight grains of gold to the ounce, or one grain to each dram, and you will always know when you pour it out how much you have. That will give you about 16 or 17 fluid ounces to a five dollar gold piece. That will keep. You may put in salt if you choose; I sometimes do that. This solution will go farther than any you buy. A few hours before you use it, neutralize it with bicarbonate of soda, borax, or any of the alkalies, according to the tone you desire. Bicarbonate of soda will give you a brown tone, and borax a black. Make it up a few hours before you want to use it, so that it will turn litmus paper blue, and I do not believe you can prepare gold to make better tones. When you make this solution it is acid, but you can neutralize it with bicarbonate of soda down to the point where a drop of it will turn green, or you can make it perfectly neutral, and add a little *aqua regia*.

IMPROVED CIRCULAR AND BAND SAW SET.

The improved saw set represented in our illustrations is claimed to work easily and surely and without injury to the saw. The manufacturers submit a large number of testimonials from sawyers in all parts of the country, and state that not one of the instruments has been returned to them for any reason whatever.



IMPROVED CIRCULAR AND BAND SAW SET.

The illustrations show the set as applied to a large circular saw and to a band saw. It is, however, we are informed, equally applicable to crosscut or upright blades. The inventor, Mr. C. E. Grundy, is a practical sawyer of some fifteen years' experience, and claims that he has tried every kind of saw and manner of filing, setting, and swaging, and that (for a circular saw to do the most work with the least amount of wear to the plate, bearing in mind the time required to put in order) teeth bent or set give the best result.

It is evident that a piece of steel like a saw tooth point will bend by a slow, firm, and even pressure being applied where it would break by a sudden blow of a hammer, the twist of a wrench, or the spring of a bar of iron.

Further, as the bend with this tool is a curve and not an angle, it is claimed that it will hold much longer, because the set is all equal and even from the point of the tooth; when the teeth are once confirmed to the set, it is only necessary to renew the set by bringing the cam to a given point, such as the stop on the cam.

Reference being had to the engraving, in Fig. 1 is shown a circular saw in position with the set applied. The operator stands behind the saw, the set being attached to the teeth by placing the bed die, A, on the point of tooth, so that the point will project beyond the die one sixteenth of an inch.

The cam lever, B, is then brought down to the stop, C, on the cam, bending the tooth toward the latter.

A four point gage is provided on the cam lever, seen at D, and E is a screw to adjust the same to the amount of set desired. The die bar, F, is governed by the thumb nuts, G, on the cam links projecting through the bed.

The advantage of this arrangement is that the bending power is brought to bear on the tooth between the two bed bearings, so that the operator has only to bear down on the cam lever; and the more power he applies, the tighter he fastens the set to the saw. A handle is provided at I for convenience in handling.

For band or jig saws, the form of the set, as represented in Fig. 2, is changed, having a longer bed, terminating in a handle having an adjustable cam link which can be moved laterally on the bed.

The die bar is the same as the circular saw set, also the cam lever, having a stop. These, together with the thumb nuts, regulate the amount of set to be given to a saw. The die bar is kept in contact with the cam by the recoil of the spring, J.

Sliding laterally upon the bed is a guide bar, K, having a narrow hanging lip and grooves, and fastened in place by the thumb screw, L.

The saw is placed on the set so as to leave the tooth to be set over the bed die, M.

The sliding guide bar is then brought up to the back of the saw, and fastened by the thumb screw. The cam is brought down to the stop, giving as much set as desired by screwing up the thumb nut, G.

A loose adjustable pawl, N, is hinged to the bed, and is used on very fine saws, to regulate the position of the teeth over the die, M, by engaging the pawl with the teeth; and as the saw is moved the pawl clicks on the teeth, every two clicks indicating the tooth to be set. The advantage of the pawl, in setting very fine saws, is that it saves the close scrutiny otherwise needed; and if the operator stops a moment, it is claimed, it shows with absolute certainty where to commence again.

The set can be used with the saw on the pulley, as it can be attached to a bench by the bolt, O. All the various sizes of these tools are now being made and sold throughout the Southern and Western States by Curtis & Co., of the Empire Saw Works, St. Louis, Mo., who have the exclusive control of that part of the United States. S. C. Forsaith & Co., Manchester, N. H., and Grandy Brothers, Stafford Springs, Conn., manufacture and sell throughout the Eastern and Middle States, from whom descriptive circulars and price lists can be obtained, and to whom all orders should be addressed.

Patented, through the Scientific American Patent Agency, April 8, 1873.

Frost Striations in Mud.

The Rev. F. R. Goulding, in the *American Journal of Science and Arts*, calls attention to the phenomenon of slight but plainly marked striations of the soil after a frost, looking as if a very light harrow had been drawn over it from northwest to southeast, leaving irregular furrows varying from half an inch to an inch and a half in depth from center to center. This aspect occurs, it seems, during black frosts in Upper Georgia, and the striæ invariably run, as above noted, both in shaded and sunny places, and whether the air be still or in motion at the time. They begin to show themselves before the frozen surface has thawed. It is noted as a coincidence that their direction is at right angles to the stratification of the country, the outcroppings of the rocks being in a line from northeast to southwest. Can any of our correspondents throw light on the question? The writer states that he has examined the phenomenon quite closely, but can find no apparent cause.

A NEW tubular wicked petroleum lamp has been contrived by MM. Defienne. It consists of ten small circular wicks in place of one large one. They are arranged in a circle, and are attached to a frame movable by a single rack.

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HOUSE TOP GARDENING.

In Mexico and in several other tropical countries, aerial gardens, constructed upon the roofs of the houses, are common, and form delightful resorts for the occupants during the cool of the evenings. Various plans for so utilizing the tops of our city houses have already been suggested, the latest and one of the most practical of which is illustrated by the annexed engravings, extracted from the *Garden*. Our neighboring city—Brooklyn—we may here remark, presents some extensive examples of gardens on the house tops, but constructed on a scale of magnitude differing widely from the ideas contemplated in the subjoined description. Several of the finest residences are built almost on the edge of the Hights, so that the roofs of the warehouses, constructed at the foot of the declivity, are almost at a level with their foundations. On these roofs earth has been heaped to considerable depth, so that the odd sight is presented of handsomely laid out terraced plots, covered with shrubbery and even small trees, surmounting massive three story and even higher brick buildings.

Mr. Lascelles, a horticultural builder, writes that he has proved the practicability of his plan, illustrated herewith, upon edifices in the very heart of London.

The plan seems practical and not expensive to adapt to any of our city houses.

The roof conservatory forms the roof story of Mr. Lascelles' offices; the floor of the conservatory, which is on a level with the bottom of the cornice shown in our illustration (Fig. 1) forms also the roof of the story beneath; it is well formed of concrete, with iron imbedded in it, to secure all the needed strength. Brick beds have been formed round the sides of the house, and these contain earth for vines, which cover the roof. The surface of these beds forms a convenient standing place for plants in pots. The house is of wood, bent by the aid of steam, and well, but not expensively, constructed, and the effect from the street is very good. The glass is not bent, although it is so in appearance. With dense shade overhead, a house of this kind would form a fernery, and, without such shade, fruits that endure a dry atmosphere might be grown after the orchard house fashion. Abundance of water would, of course, be required in any case, but this would not lead to much inconvenience, as the ordinary supply to the house could be made available by the cistern being placed on the conservatory floor. The roofs of large public buildings, such as theaters, would afford capital sites for winter gardens on a large scale; water in abundance is required on such roofs, and that is the chief requirement of the plants. In such cases, the winter garden would form a new and most attractive feature of the establishment. As regards business houses, a modification of the same plan might be desirable where very good light was required in the upper story. Such a pleasant innovation in the city naturally suggests many ways in which a like kind of glass house might be made to add to the comfort and elegance of private houses of every class, from those who could afford a well furnished winter garden to those who could only use the upper story as a playground for children. We are assured that the architectural difficulties (even in the present state of our knowledge of the subject) are surmountable. The ordinary square type of glass house would, of course, be unendurable over any handsome house. The fact, however, that palms, and many other sub-tropical plants, suited for decoration, thrive perfectly in a less brilliant light than that of a common greenhouse, would relieve the architect from the necessity of making the roof a glass shed. If the approaches to the conservatory floor were, as they should be, roomy and convenient, the difficulties of moving the soil, plants, etc., would not be so great as they might at first sight appear. This, however, seems a case to which the principle of co-operation might be advantageously applied, and we commend the suggestion, for what it is worth, to the attention of those who are interested in the matter. Suppose, for instance, a builder is about to erect a row of a dozen or so of good large houses; each of these might be furnished with its conservatory on the roof, communicating with the conservatories of the houses on both sides, so that the whole would form one continuous greenhouse, uniform in hight and architecture, and so presenting a much more pleasing appearance, when viewed from the road or street, than if the conservatory of each house was detached and built in a different style. This would form a very fine winter garden, common to all the inhabitants of the row or block of houses, much in the same way as is at present the case with many London gardens now. One consideration in favor of the house top conservatory is the facility with which it might be heated; for temperate clime plants, the always ascending heat of the house would suffice. It could be kept in excellent order by one gardener, paid by subscription from each family, who would thus, at a trifling expense, enjoy all the advantages of an extensive first class winter garden on their own premises, as it were. Another point gained would be that, by the use of one common lift (constructed while the houses are building), soil, plants, etc., for the entire row, could be raised to the roof, and thus spare each family the trouble and inconvenience of having such things carried up through the house. Some persons, from a desire of complete privacy, might object to this arrangement; but we believe that, considering the many advantages which it possesses, others may be induced to give it a trial, and it is, at least, one deserving of some consideration.

A fernery or plant case might be arranged to run the whole length of the front windows of a story, and be heated by a small boiler placed behind a fireplace. From this a two inch flow and return pipe is taken through the case, so as to heat it when required. The space around the pipes can be filled with bark, or water, if desirable, so as to produce a moist and genial bottom heat. The ferns, mosses, and other decorative plants are arranged in flat square pans of zinc or earthenware, as shown in our sectional sketch (Fig. 2), and the effect of the whole, especially when seen from within, is very effective, and affords relief to the eye, which would otherwise look out on a dismal prospect of blackened roofs and soot-begrimed chimney pots.

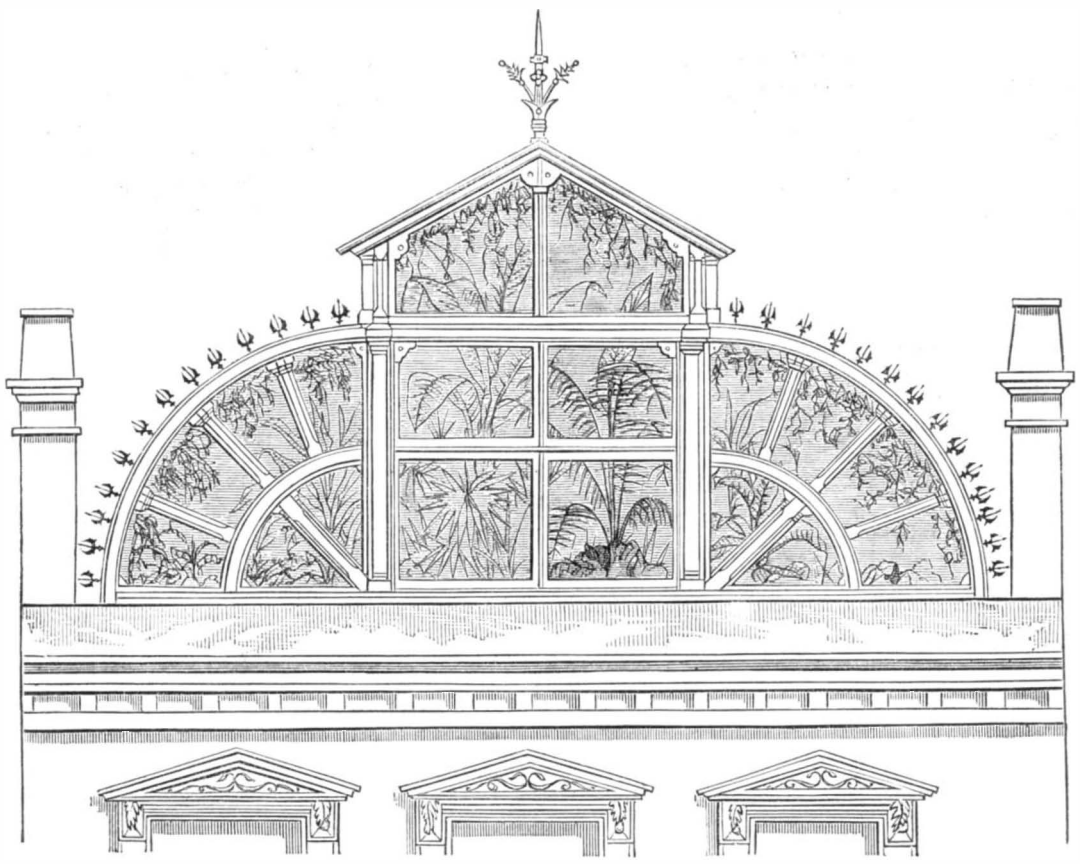

Fig. 1.—HOUSE TOP GARDEN IN THE CITY.

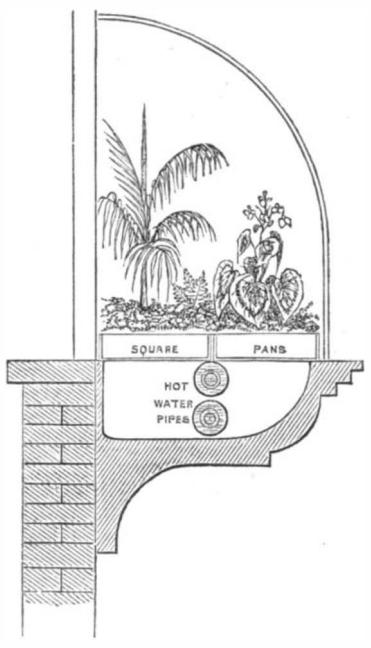

Fig. 2.—SECTION OF PLANT CASE.

We look on this elegant innovation as a great improvement, and think, with its originator, that, if generally adopted, the appearance and comfort of our dwellings and offices in the town would be considerably enhanced.

The Utilization of Waste Steam.

The London *Times* publishes the following accounts of the system to which we briefly alluded on page 167 of our current volume:

On January 28, at Stafford House, Mr. Spence exhibited to a distinguished audience a plan by which he proposes to employ the heat of waste steam as a substitute for fuel. This method is founded upon a discovery made by the father of the inventor, and announced by him to the British Association at its meeting at Exeter, in 1869. The discovery was that steam liberated at atmospheric pressure—that is, at a temperature of 212°—and passed into any saline solution having a boiling temperature higher than that of water would raise this saline solution to its own boiling point. Thus, as Mr. Spence showed experimentally, if we take a solution of nitrate of soda, which boils at 250°, and if we blow into that solution steam at 212°, the temperature of the solution will be raised to 250°, the steam being condensed and yielding its heat. The explanation seems to be that the salt has a stronger affinity for the water in the steam as water, than the heat has for it as vapor. The water is therefore seized by the salt, and the latent heat is evolved as heat of temperature. A single cubic inch of water made into steam at 212° will raise 6 cubic inches of water from 32° to 212°, which shows the enormous amount of latent heat that steam contains. In utilizing the exhaust steam (at 212°) from a high pressure engine, Mr. Spence brings it into contact with a solution that has a boiling temperature higher than that of water. For this purpose he prefers to use a solution of caustic soda, on account of its high boiling point, and because it is not liable to act injuriously upon iron. The exhaust steam will raise a solution of caustic soda to a temperature of 375° (more or less, according to its density), and the heated solution is then circulated through pipes in an ordinary boiler, and its heat is radiated, for the purpose of generating steam in the place of heat derived from fresh fuel. If the boiler is at a pressure of 30 lbs., the solution will leave it at a temperature of 250°, so that 125° of heat would have been radiated to the water. The solution having been to some extent diluted by the condensation of the exhaust steam, its capacity for heat will be reduced in a corresponding degree; and if steam at 212° were again blown through it, it would not reach the same temperature as before. It is therefore passed into another boiler of ordinary construction, where it takes the place of water, and is concentrated by steam being generated from it. In this way its original capacity for receiving heat is restored. Besides this method of utilizing the waste steam of high pressure engines, Mr. Spence has found the principle equally applicable, and with even greater advantages, to the condensing engine. The solution may be brought in contact with the exhaust steam in an ordinary surface condenser. A partial vacuum is produced, because, although the injected solution may be of higher temperature than the steam, its absorbing power of heat is in the same ratio as that of cold water to steam. The solution is again heated to a degree capable of generating steam, and the vacuum is produced. Mr. Spence maintained that if, by taking advantage of his father's discovery, a mode of utilizing the large amount of latent heat contained in the steam now thrown into the atmosphere could be brought into practical operation, so that this latent heat could be made to do actual work, the discovery, especially at the present price of fuel, would be one of enormous value, and he announced his intention of speedily trying the experiment on a manufacturing scale. Mr. Crampton objected to Mr. Spence's project that the amount of tubing required for the conveyance of the caustic soda solution would be so large that it would eat up any profits likely to accrue from the discovery, and the audience generally, although the facts proved by Mr. Spence were new to them, seemed little disposed to admit that they would prove to be of any practical value. On this point, however, the larger experiments which Mr. Spence is about to institute must shortly remove all doubt."

We publish the above, says *Engineering*, because the facts upon which Mr. Spence's proposed scheme is based are of some interest; but it appears to us evident that, quite apart from the complication of the proposed arrangements, their employment could only be attended by a dead loss instead of an economy, as the heat expended in re-evaporating the steam condensed in the caustic solution (so as to keep the latter at its normal density) must evidently exceed that imparted by the caustic solution to the boiler.

The Main Force of Culture.

Science occupied a low position until of late years; and great and honorable as it is now, does not deserve to be considered as the leading influence in culture. The main force of culture is industrial art. It enabled the first savages to make the flint knives, the stone axes and mortars, the bows, arrows, spears, slings, harpoons, nets, boats, huts, fire sticks, and digging sticks (the earliest implements of tillage), without which they could not have raised themselves above the level of the brute. It enabled the stone-age savages to smelt copper and tin and unite them in a hard, elastic alloy fit for swords, spear heads, arrow heads, helmets, breast plates, shields, chisels, hoes, plow points, hammers, axes, and knives. Then, and not until then, did men have durable dwellings of cut stone, productive tillage with the capacity to maintain many people in a small area, cities, national organizations

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laws, well disciplined armies, systematic civil polity, religion and ornamental art. Several thousand years elapsed before this beneficent industrial spirit, which had first taught the savage to fashion tools of stone and then elevated him to the bronze age, raised him to the age of iron by teaching him to smelt, forge, temper, and weld the most useful of all the metals. If the useful arts had done nothing for man but to teach him how to work stone, bronze, and iron, they would deserve the credit of laying the indispensable foundation of all our culture, and thus doing more for us than any other branch of human employment has done. But their service did not cease there. It has continued and still continues with increasing beneficence. If we divide culture into a dozen eras instead of three, the stone, bronze, and iron ages, we should have to designate nearly all of them from industrial events. The sailing vessel, the mold board which turns over the furrow of the plow, the water wheel, the magnetic needle, gunpowder, the paper mill, movable type, the spinning wheel, the telescope, the quadrant, the chronometer, the steam engine, the steam boat, the steam railroad, the steam blast in smelting furnaces, the puddling furnace, the rolling mill, the labor-saving machinery of a thousand kinds—these are triumphs of industry, and the main causes of the superiority of modern over ancient civilization. It is the working man, not the soldier, the priest, the statesman, the philosopher, the scientist, the artist, or the author, who has given us not only the foundation, but also most of the superstructure, of our culture.—*Overland Monthly.*

TO NEW SUBSCRIBERS.

All subscriptions to the SCIENTIFIC AMERICAN will be commenced with the year, unless persons, at the time of remitting, request to the contrary. Nearly all subscribers preserve their numbers for binding; and in most cases where subscriptions are received during the first quarter of the year, if the back numbers are not sent, they are subsequently ordered. To save both the subscribers and ourselves trouble, the back numbers from January 1 will be forwarded, unless we are advised to the contrary. This course will be pursued till April 1, after which date the paper will be sent from the time of receipt of remittance; but subscription. may commence at any time, at the request of the subscriber, The above regulation applies only to those who give no instructions, at the time of remitting, as to when they desire to commence.

Death of the $40,600 Cow.

The celebrated Eighth Duchess of Geneva, the short horned cow to which we have already referred as bringing the enormous price of $40,600 at the sale of Mr. Campbell, at New York Mills, recently died in giving birth to a calf. It will be remembered that the animal was purchased through a mistake by the agent of a noted English cattle breeder, and subsequently resold to Col. Lewis G. Morris, of Fordham, N. Y., for $30,600. The loss is not only a heavy one pecuniarily, but a severe disappointment to the latter gentleman, as it was his object to use the cow as a means of materially improving the breed of short horned cattle in the United States. Col. Morris has still a large fortune invested in choice stock.

NEW BOOKS AND PUBLICATIONS.

HEAT AS A SOURCE OF POWER, with Applications of General Principles to the Construction of Steam Generators. By William P. Trowbridge, Higgin Professor of Dynamic Engineering in the Sheffield Scientific School of Yale College. Price $3.50. New York: John Wiley & Son, 15 Astor Place.

Professor Trowbridge has succeeded in producing a work which, we think, cannot but be of much benefit to every student of mechanical engineering. It is intended as an introduction to "The Study of the Steam and other Heat Engines," and, as its title indicates, is devoted to the careful discussion and thorough elucidation of the steam generator. The various types of the latter are fully considered, and their theoretical and practical construction explained. The initial chapters on heat, combustion and fuel, are admirable treatises on their respective topics, clearly written, and containing the the most approved formulæ and rules. There are numerous illustrations and a brief appendix, with tables, &c. The volume is eminently practical in its tendency, and will form a valuable hand book for the professional engineer.

THE CONSTANTS OF NATURE. Part I. Specific Gravities, Boiling and Melting Points, and Chemical Formulæ. Compiled by Frank Wigglesworth Clarke, S. B. Washington, D. C.: Smithsonian Institution.

A volume of tables, compiled with great labor and research, of the gravities of nearly all known elements and compounds. The work is thoroughly well done, and the book will be found useful in every laboratory.

BUILDING CONSTRUCTION: BRICK. BUILDING CONSTRUCTION: TIMBER. Each Two Volumes (Text and Plates). By Robert Scott Burn, C. E., Author of "The Handbook of the Mechanical Arts," etc. Each Volume, 75 cents.

INORGANIC CHEMISTRY, for Use in Science Classes and Higher and Middle Schools. By W. B. Kemshead, F.R.A.S., F.G.S., Lecturer at Dulwich College, London. 75 cents.

ELEMENTS OF ZOOLOGY, for Schools and Science Classes. By M. Harbison, Head Master of the Newtownards Model School. 75 cents.

These volumes form parts of the admirable "Elementary Series" issued by Messrs. G. P. Putnam's Sons, corner of Fourth avenue and 23d street Like the previous volumes published under this head, they are practical, lucid, and concise, and may be relied on as accurate treatises on their respective subjects.

Messrs. B. K. Bliss & Sons, of 23 Park Place, New York city, forward us the nineteenth edition of their illustrated spring catalogue of seeds, plants, etc., with supplement for 1874. The book contains a descriptive list of some 2,000 varieties of flower and vegetable seeds, a number of beautifully colored lithographs of flowers, etc., find an immense number of excellent engravings. There is beside a large amount of valuable information upon the subject of gardening generally, which will render the volume a useful guide both to the amateur and the professional gardener. The price is but 25 cents. The same firm also issue an abridged catalogue containing an almanac for the year and useful hints for every month. This is mailed on receipt of two three-cent stamps. The catalogue of potatoes for seed, which is forwarded free, has practical remarks on potato culture and full descriptions of many new and excellent varieties. The advertisement of the above enterprising firm will be found on the last page of this issue.

PATENT OFFICE DECISIONS.

United States Circuit Court---District of Massachusetts.

ADAMS ELECTRO-NICKEL PATENTS.—UNITED STATES NICKEL COMPANY *vs.* N. SHEPARD KEITH.

[In equity.—Before Shepley, Judge.—October Term, 1873, to wit, February 13, 1874.]

The defendant is charged with infringement of letters patent of the United States, granted to Isaac Adams, Jr., for "improvements in the electric deposition of nickel," dated August 3, 1869, and May 10, 1870, both of which patents have been duly assigned to the complainants.

Respondents deny the infringement, and allege that Adams was not the original and first inventor of what is claimed as his invention in either of the patents.

The history of the state of the art of electroplating with nickel, or what should with more propriety, in view of the progress then made in the art, be denominated the electro-deposition of nickel, prior to the discoveries of Dr. Adams, is sufficiently given, in the opinion of this court, in the case of United Nickel Company *vs.* Anthes. *Official Gazette*, vol. I., p. 578, not to require repetition here, otherwise than by reference to, and reiteration of, the views expressed in that case. Much additional evidence has been introduced in the record in this case upon the issue of novelty. Yet, after a careful review of the whole evidence, both in relation to what was alleged in that case as anticipating the discoveries and inventions of Dr. Adams, and is again alleged in this record, accompanied with further proof, as well as what additional and new matter is here introduced, I am confirmed in the conviction that the electro-deposition of nickel by means of the described solutions prepared and used, as described in his patents, and of such an anode as his patents describe, was unknown in any practical application of it to the useful art of electro-plating of metals, prior to the discoveries of the patentee. By electro-plating of metals as a useful art, I mean the uniform, continuous, and coherent deposit of one metal upon the surface of another, so as to produce a coating of the desired thickness, purity, uniformity, coherence, and permanency of adhesion, as distinguished from the mere electrolysis or electro-deposition of a metal out of a solution, whether such electro-deposition be or be not on the surface of another metal. And herein, in my view, consists the difference in the state of the art prior and subsequent to the discoveries of the patentee. Prior to his discoveries and inventions, electroplaters and electro-metallurgists well understood how desirable a result it would be to be able to plate the surface of baser metals with a coating of nickel, resembling silver in luster and color, without its liability to tarnish on exposure to the air. Yet while it was thus well understood, as stated by Napier, that if the practical difficulties could be overcome, "the application of nickel to the coating of other metals would be extensive, and the property of not being able to tarnish would make it eminently useful for all general purposes; yet, with all the research and investigation which have been so lavishly bestowed on this case, the respondents have signally failed to show that electroplating of metals with nickel had any practical existence as accessible or beneficial to the public before the date of the inventions of Dr. Adams. Since that time, under the processes described in his patent, the art is so extensively practised, both in this country and Europe, that, as stated by one of the witnesses in this case, it would be less difficult to name articles used in the mechanic arts which have never been nickel-plated than those to which nickel-plating has been applied. The claims in the two patents are as follows: In the patent of August 3, 1869:

1. The electro-deposition of nickel by means of a solution of the double sulphate of nickel and ammonia, or a solution of the double chloride of nickel and ammonium, prepared and used in such a manner as to be free from the presence of potash, soda, alumina, lime or nitric acid, or from any acid or alkaline reaction.

2. The use for the anode of a depositing cell of nickel, combined with iron, to prevent the copper and arsenic which may be present from being deposited with the nickel or from injuring the solution.

3. The methods herein described for preparing the solution of the double sulphate of nickel and ammonium.

4. The electroplating of metals with a coating of compact, coherent, tenacious, flexible nickel, of sufficient thickness to protect the metal upon which the deposit is made from the action of corrosive agents with which the article may be brought in contact.

Also, but which is not involved in this suit—

5. The deposition of electroplates of nickel, to be removed from the surface on which the deposit is made, and used separately therefrom.

In the patent of May 10, 1870, the claims are as follows:

1. The combination with nickel to be used for anodes, of a metal or metalloid, electro-negative to the nickel in the solution displayed.

2. A nickel anode, combined with carbon and cast in the required form.

As the respondent has infringed the patent of May 10, 1870, by the use of anodes in the electro-deposition of nickel, substantially like those described and claimed in that patent, and has also infringed the first claim of the patent of August 3, 1869, by the use, in the electro-deposition of nickel, of a solution of the double sulphate of nickel and ammonia, prepared and used in such a manner as to be free from the presence of potash, soda, alumina, lime, or nitric acid, or from any acid or alkaline reaction, it is not necessary to decide the questions presented on the constructions of the fourth claim of the patent of August 3, 1869.

In deciding that the evidence in the record proves an infringement of that patent by the use of the solution therein described, I do not overlook the fact that respondent's solution contained one one-thousandth part of tartrate of ammonia, and one eight-hundredth part of ammonia.

The evidence in the case satisfies me that in the defendant's solution the first was an inert substance, and the second would be, and was, speedily eliminated from the solution in use by evaporation.

Decree for injunction and account as prayed for in the bill.

DECISIONS OF THE COURTS.

United States Circuit Court---Southern District of New York.

PATENT PAPER BAG MACHINE.—THE UNION PAPER BAG MACHINE COMPANY *et al. vs.* G. L. NEWELL AND G. H. MALLARY.

[In equity.—Before Blatchford, Judge.—Decided November 26, 1873.]

This is an application for a preliminary injunction, to restrain the defendants from infringing letters patent granted September 12, 1865, to Benjamin S. Binney, assignee of E. W. Goodale, the inventor, for a "machine for making paper bags." As the claim of infringement on this application is confined to the first claim of the patent, only such parts of the specification need be referred to as relate to that claim. The specification says:

"This invention consists, first, in giving to the side cutters an irregular curve at or near their inside ends, in such a manner that the form of the paper cut by their action, and the corners produced by folding said paper, are of such a shape that the paste shall come upon the paper where it is single, and thus be enabled to hold better than it does when it is applied in the ordinary way.

It designates as "side cutters" the cutters "which serve to cut the paper so that the sides may fold and make the seam in the center of the bag." It says that

These cutters or knives are bent in an irregular curve near their inner ends, so that the paper cut by their action, and the corners produced by folding said paper, are such that the paste shall come upon the paper where it is single, and that it will hold better than it does when applied to the paper in the usual manner.

One of the figures in the drawings contains lines which are said, by the specification, to designate the cuts made by the side cutters. The first claim is in these words:

Making the side cutters, B, with curved ends, substantially as and for the purpose set forth.

In the defendants' machine there are cutters which serve to cut the paper so that the sides may fold and make the seam in the center of the bag. They are side cutters. They make a cut of a definite length from the outside edge of the paper inward toward the center, so as to leave flaps or side pieces, which are then to be folded over from each side toward the center, overlapping each other at the center, and making a seam in the center. The defendants' side cutters are not straight or unbent in their whole length, nor are they bent at an angle near their inner ends; but they are bent in a curve near their inner ends. The effect of this curve is that, when the side pieces are folded over, the central end piece, of a single thickness of paper, may be pasted down without folding over, in addition to such single thickness, any part of the double thickness formed by folding the sides, and yet the corners will be perfectly close and tight. This result is due to the curve near the inner ends of the side cutters in contradistinction to an angle there. Where the cutters have an angle there, and the central end piece, of a single thickness, is pasted down without folding over, in addition, any part of the double thickness, there are holes or openings at the corners, and, to make tight corners, it is necessary to fold down part of the double thickness, and then the paste can only come upon the inner one of the two thicknesses, while the outer one, not being held to the inner one, tends to draw the inner one away from the surface to which it is pasted. This is precisely what is done by the patentee's arrangement, and what he describes in the specification as the result of his arrangement, when he says that the form of the paper cut by the curved side cutters and the corners produced by folding said paper, are of such a shape that the paste shall come upon the paper where it is single, and thus hold better than when applied to the paper in the usual way. The language of the specification is not very artistic, and the idea sought to be conveyed is not as well expressed as it might be; but the meaning cannot be mistaken, when read in view of the state of the art by a person skilled therein.

It is to be noted that the body of the specification speaks of the curve near the inner ends of the side cutters as being an irregular curve, and that the claim drops the word "irregular," and claims making the side cutters "with curved ends, substantially as and for the purpose set forth." It is contended by the defendants that the drawing of the patent shows the cut made by the side cutters as being, for its whole length, of a form of curve which may properly be called irregular, as a whole, and that the defendants' side cutter is straight for most of its length, and of a regular curve near its inner end. But this is immaterial. It is not shown that any side cutter with a curved inner end, for the same purpose, existed before. That being so, any degree of curve to the inner end of the cutter, which will produce the result described, is within the claim, and must be regarded as an irregular curve, whatever the word "irregular" may mean. Nothing but a curve will produce this effect. An angle will not. The patentee was the first to use the curve. The form of curve represented in his drawings will produce the effect. His claim speaks merely of "curved" ends. Hence any curved end which will produce the result is his curved end.

It is contended for the defendants that, as the patent sued on was issued under the authority of the act of July 4, 1836, (5 United States Stat. at Large, 117,) and as that act is repealed by the 111th section of the act of July 8, 1870, (16 id, 216,) such repeal vacated and made void the said patent; and that if this is not so, yet no suit can be maintained upon said patent for any cause of action which accrued after the 8th of July, 1870, as did the cause of action in this suit. The 111th section of the act of 1870, which repeals the act of 1836, contains the proviso that "the repeal hereby enacted shall not affect, impair, or take away any right existing under" the repealed act, "but all actions and causes of action, both in law and in equity, which have arisen under" said act, "may be commenced and prosecuted, and, if already commenced, may be prosecuted to final judgment and execution in the same manner as though this act had not been passed, excepting that the remedial provisions of this act shall be applicable to all suits and proceedings hereafter commenced."

The rights created by, and arising under, a patent granted under the act of 1836, are rights existing under that act. The proviso declares that the repeal of that act shall not affect, impair, or take away such rights. A right granted by the patent in suit is the exclusive right to make and use and vend to others to be used, the inventions claimed in the patent. Such right was a right existing under the act of 1836 on the 8th of July, 1870. The right to sue after the latter date for infringements of the patent committed after that date, may in one sense, be said not to have been a right existing on the 8th of July, 1870, because the cause of action had not then arisen. But the grant held under the patent was a right, and a vested right. Such grant, it was intended, should continue till it should expire by its limitation. This is apparent from the provisions of the 63d and 64th, 65th and 66th sections of the act of 1870, which enact that patents granted prior to March 2, 1861, (and which were patents for fourteen years) may be extended for seven years beyond the original terms of their limitation.

It is further urged that the wording of the proviso to the 111th section of the act of 1870 is such that the only right saved is the right to prosecute actions and causes of action which arose prior to July 8, 1870, on patents theretofore granted. No reason is assigned why, if such prosecutions are allowed, they should not also be allowed in respect of causes of action arising on or after July 8, 1870, on such patents. But the point taken is rested solely on the fact that the enactment in reference to prosecutions is introduced by the word "but;" and it is maintained that the effect of the use of that word is that the rights declared in the preceding part of the proviso to be not affected, are limited to the actions and causes of action afterward specified, that is, to such as arose before July 8, 1870. No such effect, however, can properly be given to the use of the word "but." The first part of the proviso, as already stated, has the effect to keep in life the patent and its grant. But actions had been brought and were pending on existing patents, which had not been sued on, and the provisions of all prior existing acts in regard to suits on patents were being repealed. Hence, the necessity of providing that such actions and causes of action might be prosecuted in the same manner as though the act of 1870 had not been passed. But the proviso goes on to declare that the remedial provisions of the act of 1870 shall apply to all suits thereafter commenced for causes of action existing on the 8th of July, 1870, under patents previously granted. It leaves existing suits to be conducted according to the remedial provisions prescribed by the prior acts. There remain, however, suits to be brought on causes of action arising on or after July 8, 1870, on patents theretofore granted. The proviso does not apply to the manner of conducting such suits. The existing patents and the grants of right in them, being saved by the proviso, a reference to prior sections of the act shows that those sections apply to then existing patents, and to suits to be brought thereon, for causes of action to arise on or after July 8, 1870, as well as to patents to be issued under the act of 1870, and to suits to be brought thereon. Thus the 53d section, in regard to reissues, embraces reissues of existing patents. If not, as all prior acts are repealed, there could be no reissues of such patents. The same is true of the 54th section, in regard to disclaimers, and of sections 55, 56, 58, 59, 60, 61, and 62, in regard to suits. Full authority is given by the latter sections for bringing this suit.

As to the alleged licenses set up by the defendants, it was fully considered and passed upon in a former suit in this court, between the parties to this suit, where it was held, on final hearing, that such license had no valid existence, as a license, in the hands of the defendants, as against the Union Paper Bag Machine Company, and persons holding under them.

Nothing is shown to affect the novelty of the first claim of the patent sued on. the infringement is clear, and the case, on all points, is one entirely free from doubt.

The injunction asked for must, therefore, be granted.

George Harding and Fisher & Duncan, for plaintiffs.

Marcus P. Norton, for defendants.

IMPORTANCE OF ADVERTISING.

The value of advertising is so well understood by old established business firms that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation, among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of more than 42,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world.

Recent American and Foreign Patents.

Improved Locomotive Driving Wheel.

Joseph C. Wilson, Oshkosh, Wis., assignor to himself and Mahlon P. Barry, same place.—This invention consists in a driving wheel formed of an inner and an outer wheel, of which the former sustains the weight of the locomotive on its hollow shaft, and revolves along the inside of the tyre of the outer wheel, the solid shaft of which passes through the hollow outer shaft. The addition of the hollow shaft, it is claimed, adds greatly to the strength of the locomotive axle, and the working of the inner wheel in the outer increases the driving power considerably by economizing in the wear and tear of the tyre, and otherwise.

Improved Apparatus for Converting Motion.

Romulus R. Stevens, Stockton, Cal., assignor to himself and Lewis M. Cutting, same place.—This invention consists of a reciprocating toothed bar above the axis of the shaft to be driven, and another below it, in different planes, connected together by yokes. With these are combined a toothed wheel on the shaft, and apparatus for shifting the bars at each end of the stroke to change them, so that one turns the wheel going one way, and the other when going the other way, thus giving continuous motion to the wheel. The invention also consists of a cam and spring, so combined with the shaft as to expend some of the excess of the power of the piston at mid-stroke on the spring, and return it to the shaft during the latter portion of the stroke, when the effect of the steam is diminished, to equalize the application of power. By this arrangement, it is believed, power may be largely economized, because the application of it is always at the rims of the toothed wheels; also because the balance wheel is dispensed with, and the engine enabled to run slower, as compared with the speed of the driving shaft.

Improved Pump.

Thomas Wilmington, Ossian, Ind.—This is a double acting lifting pump, having two cylinders made in a block of wood, with a metallic water chamber above the cylinders, or resting on the block. A plate on top of the chamber has a valve orifice, which is closed by a valve. Above the valve is another metallic chamber, which is covered by a plate, to which the delivery pipe is attached. The lower valves are seated on the plate beneath the block, to which plate the induction pipes are attached. The bucket rods pass through stuffing boxes, and extend up to the top of the stand, where they take hold of the ends of two vibrating bars. The bars work on a pivot rod, which passes horizontally through the top of the stand, and their ends extend back from the pivots, and enter loosely the ends of the cross of the working lever. The working lever is vibrated on the pivot in the top of the stand, and motion is imparted to the pistons thereby.

Improved Boot Pac.

James A. Weaver and William B. Hawkins, East Saginaw, Mich.—The sole leather boot pacs worn by lumbermen and other woodmen, and known as "tongue pacs," have heretofore been made with seams at the quarters; also with seams from the top of the upper, a little each side of the instep, along the sides of the top of the foot, to the top of the toe, thus making the upper of three pieces, which require several seams for sewing them together. It is now proposed to make the whole upper in one piece, which is joined together at the heel by one short seam only. The latter is thus located where it is so re-enforced and stiffened by the counter that it is not so liable to open and leak when the leather is water-soaked. The leg is sewn to the upper, so that its seam does not join the upper at the seam of the heel of the latter, so that the tendency to open at the junction is lessened.

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Improved Truck.

Andrew V. Smith, San Francisco, Cal.—This invention relates to that class of hand trucks wherein a ratchet and pawl mechanism is employed to retain the truck in a stationary position while loading, as in the patent, No. 114,218, granted to same inventor. In using the attachment, when the trucks have been run up to the side of the packages to be moved, and are stood up in the ordinary manner, the operator puts his foot upon the middle part of a chain and presses it, throwing the engaging ends of pawls into gear with teeth, locking the wheels so that the trucks cannot move back as the packages are placed upon them. When the trucks are loaded, a slight forward movement will throw the pawls out of gear, the incline of the teeth forcing the engaging ends of the said pawls back sufficiently to carry the line of draft of the springs past the pivots of the pawl.

Improved Window Sash.

Hiram C. Burk, New Cumberland, O.—The object of this invention is to improve the window sashes in such a manner that they slide easily in the frame without rubbing off the paint, and that they may be quickly and readily detached for repairs, and conveniently fastened. The window frame is provided with grooves lined with sheet metal. The sash has projecting side rails, of which one slides loosely in a groove of the sash, while the other is firmly connected thereto. The sides of sash facing the window frame are rounded off to produce as little friction as possible, and prevent the rubbing off of the paint from the adjoining parts of the frame. The groove leaves a solid part at the lower corner, on which the loose rail is supported, so that it cannot drop out on hoisting the sash. A hook-shaped projection at the upper end of the loose rail serves to lift it out of the groove, so that the sash may easily be taken out of the window frame, as the rounded-off side offers no obstruction to its detachment. The fixed rail is provided with notches, into which snaps a projecting catch of a band spring, which is suitably applied into a recess of the frame, retaining the sash at any desired position.

Improved Blacking Box.

Charles W. Beebee, Ravenswood, N. Y.—This invention has reference to that class of blacking boxes which are constructed of wood and provided with a handle and cover. It consists in forming the recess or cavity for the reception of the blacking by means of augers or boring tools, so as to lessen the cost of manufacturing said boxes, and, at the same time, to form scalloped inner sides or projections, which are designed to form a surface for rubbing the brush, in order to spread the blacking evenly on the same.

Improved Wheel Plow.

Solomon Neff, Cuba, Ill.—The wheels revolve on short axles, through the inner ends of which are vertical slots that receive the arms of a frame, on which is supported a plow frame. To the frame is attached a horizontal extension, to which a plow frame is loosely pivoted, so as to have free lateral play. The plow frame is thus held securely in a horizontal position at any desired depth, the vertical arms of the frame being adjustable in slots of the short axles, and held by wedges at any hight. The tongue is loosely pivoted on the cross bolt, so as to move freely in a lateral direction, while it also turns on a vertical pivot bolt in a horizontal clevis, adjustable in different holes, according to the furrow width which is intended to be cut. Thus the tongue not only determines by its position the width of furrow slice, but also preserves its freedom of lateral motion.

Improved Apparatus for Making Gas.

Joseph D. Patton, Trevorton, Pa.—The object of this invention is to provide a means for the manufacture of illuminating gas from petroleum in any liquid form, in a single retort, without subjecting it from the first to the intense heat necessary to convert it into fixed gas, and to provide for the purification and storage of the gas in a simple and efficient way. The invention consists, first, of retorts of any form placed in a furnace to secure temperatures varying from bright red heat at one end to very dull red heat at the other end of the same retort, with connections arranged to admit the oil at the coolest part, and cause it to pass along to the hottest part and out thereat when converted into gas. Second, the invention consists of a condenser located in the gas holder, divided longitudinally into compartments communicating with each other at top and bottom, the inlet pipe from the retort communicating with one compartment near the bottom, an escape pipe connecting with the bottom of the other, an exhaust pipe for taking out the deposit, and both compartments being surrounded with water. Third, a small boiler communicating with the water tank surrounding the condenser by two pipes, one lower than the other, the boiler being below the water level, and having means for heating the water to prevent the water of the condenser from freezing in cold weather.

Improved Bench Plane.

Henry A. Gatley, South Boston, Mass.—This invention is an attachment for jack and other hand planes, which will enable the plane irons to be easily, accurately, and quickly attached, detached, and adjusted without hammering, and without any danger of springing the plane and making it untrue. A plate is let into the stock at the upper part of the inclined seat for the plane irons. To lugs on the lower side of the plate is swiveled a hand screw, the hand piece of which can be conveniently operated. Upon the screw is placed a nut, a toe of which enters a hole in the plane irons, so that the said plane irons may be adjusted by turning the screw. Through suitable mechanism, by turning a hand screw forward, a plate acts as a lever to lock the plane irons securely in place.

Improved Photographic Background.

Preston C. Nason, Columbus, O.—This invention is an improved background carriage for photographer's use, enabling the operator to adjust it while standing sufficiently far in its front to see when it is brought into position to give the desired effect in the relief of light and shade. The frame of the carriage consists of two side bars, inclining toward each other, and connected at their upper, lower, and middle parts by three cross bars. A metallic rod, rigidly attached to the centers of the cross bars carries a socket which may be turned and moved up and down upon the said rod. The socket is secured in place by a set screw resting against the rod. Upon the side of the socket, and at right angles therewith, is formed a second socket, to receive the spindle of the background, which is secured in place by a set screw.

Improved Wheel for Vehicles.

Joseph H. Glover, Freedom, Ky.—This invention relates to the construction and arrangement of devices for adapting a wheel for application of a cold tyre and securing the same to the felly. A tube receives the axle, and has boxes to receive the wear inserted in its ends. The hub is made in two parts; one is permanently attached to the tube, and the other slides upon said tube, both being made exactly alike. The outer surface of the parts is inclined in line with the curvature of the spokes, so that the wheel will pass any obstruction that will allow the rim of the wheel to pass. The parts are connected by right and left screws, which screw through the inner plates of said parts, and enter holes in their center blocks. Upon the centers of the screws are formed heads for convenience in turning them to move the parts toward or from each other, and thus lengthen or shorten the spokes. The spokes are made forked in their inner parts, and solid in their outer parts.

Improved Ice Cream Freezer.

Charles Gooch, Cincinnati, O.—The top board, which is for the purpose of keeping the shaft of the dasher perpendicular, and also to hold a pin to prevent the can from turning when it is desired it should remain stationary, has two grooves on the under side, which fit upon the top edges of the tub. The distance between the grooves is less than the diameter of the tub at the top; hence it always requires to be sprung on by compressing the tub slightly; and by reason of the grooves being cut under on one or both sides, the bar and tub are firmly connected, so that the former may be used as a handle for lifting or carrying about the other. This mode of connection dispenses with catches or other supplementary metallic fastening devices. A short shaft is detachable from the cover of the can, and made square or polygonal at its ends, to adapt it for application of a crank and application to the said cover. It is used when the cream has been partially frozen or solidified, and the stirrer removed in consequence. The rotation of the can is then continued by the short shaft, and the freezing process completed.

Improved Passenger Register and Recorder.

José Medina and Manual Medina, Cordova, Spain.—The passenger register consists of a bell crank lever, which is set in motion by the passenger on entering the vehicle, and acts on a spring below. The latter communicates through suitable mechanism with a graduated indicator dial. The time register is constructed of a regular clock train, which carries, instead of index hands, a rotary dial marked with hours and minutes, and has above it a spring so arranged with a pencil or other marker that, when said spring is depressed by the weight of the passenger on the seat, the pencil will bear on the dial and mark, by the gradations thereon, the exact time during which the seat was occupied. The pencil also marks the time when the passenger rises.

Improved Joiners' Floor Clamp.

William W. Ingrum, Batesville, Ark.—The parts are put together with a pivot, on which they open and close, the same as a pair of tongs. A double ratchet bar, passing through mortises in the shanks, keeps the jaws closed when they are attached to the timber of the floor or ceiling. The ratchet is made double, so that the clamp may be used overhead, and drops by its own gravity and engages automatically. Screw points through the ends of the jaw are turned by means of a small pin, and the points enter the sides of the timber and prevent the jaws from slipping. A metallic bar, which is loosely pivoted to one jaw, is attached to a piece of wood, which is placed against the flooring or ceiling which is to be forced up to its place. This bar is rounded on its inner side, and will roll or rock on the jaw and maintain a position parallel with the floor. A drag bar is pivoted to one of the shanks. The lower end drags on the timber, and it acts as a pawl to hold the clamp in position. The clamp, as a whole, is a lever, the purchase of which is the distance between the fulcrums and the center of the metallic bar. This machine is applicable to many purposes, but is more particularly designed to facilitate the laying of floors, ceiling overhead, or on walls and in similar places.

Improved Wagon Springs.

John Carpenter, Mariner's Harbor, N. Y.—An elliptic is formed of four pieces of wood connected by hinges at the ends. Rubber springs are confined in recesses made in the pieces and in the axle and bolster. The pieces act as levers when the spring is in use. Plates of rubber are placed between the axle and bolster and the inner ends of the lever. This, it will be seen, is a double spring, and is designed for a vehicle.

Improved Whiffletree.

Lewis H. Webb, South Quay, Va.—A crotch is made in the end of the strut against which the truss rod bears, and a ring is fitted in the angle formed by the trees and the branches of the strut, for attaching to the clevis, said ring being to sustain the wear of the clevis, and being arranged so that it can be shifted around in its place at any time to turn the worn place away from the clevis, and present another unworn place. The ring has a groove in its periphery, in which the truss rod and the branches of the strut bear to hold it in place. The ends of the truss rod pass through the caps at the ends of the whiffletree to receive the couplings and to hold said caps securely against becoming detached. For connecting the traces to the couplings, a ring of two parts is employed, so contrived that, when separately hooked into the coupling and then placed together, they form a complete ring in which another ring in the trace can be engaged by separating the parts a little without removing them from the coupling, and hooking the trace ring first in one and then in the other. It is equally as well adapted for the connection of a toggle pin or any ordinary hook as a solid ring, thus allowing harness with any of the ordinary hitching attachments to be used.

Improved Furniture Spring.

William T. Doremus, New York city.—This invention is an improved spring for chairs, and other articles requiring a rocking motion. Two plates, made with a bow in their middle parts, are attached to the seat and pedestal of a chair. There are three blocks made of elastic material. One is interposed between the bows of the plates, the second and third are placed within the separate bows of each plate. By adjusting the nuts of bolts which pass through them, the tension or strength of the springs may be regulated at will; and by tightening some of said nuts more than others, the spring may be adjusted to have more or less elasticity in either direction.

Improved Bracelet Fastening.

Henry Stone, Newark, N. J., assignor to Mulford, Hale & Cottle, New York city.—This invention has for its object to improve the construction of the bracelet catch so as to make it more safe and reliable in use. The invention consists in the combination of a spring catch with the hinged cap that shuts down over the ordinary spring catch of a bracelet.

Device for Promoting Combustion and Furnace for Steam Boilers.

Daniel T. Casement, Painesville, O.—The first invention relates to the use of balls, blocks, or other pieces of metal in a layer above the bed of fuel for the gases to pass through as they rise from the fire and impinge upon the surfaces of the blocks, whereby they are more thoroughly mixed with the oxygen, and also more effectually consumed; and the invention consists of devices, instead of a grate, for suspending said balls or blocks. The second invention consists of a tube at the center of the fire space, extending from the water space at the bottom up through the fire and above the crown sheet, with stuffing joints, and having the grate for supporting the balls or other pieces of metal attached to it. The grate is composed of tubes which receive the water for protecting them from said vertical tube, and deliver it at the outer part to a coil which secures the balls against bearing on the side walls of the furnace, and also circulates between the balls to keep them from fusing, and for generating steam. It finally discharges into the central supporting tube. The invention also consists in hollow dampers arranged in the smoke stack for utilizing the waste heat. Further particulars regarding these inventions will be found in the illustration and description published on page 135 of our current volume.

Improved Washing Machine.

John Darlington, Mazomanie, Wis.—Uprights connected at the upper and lower ends by longitudinal pieces carry rolls, the top one of which is fluted. To cause the clothes to move evenly and suffer a uniform compression, spring pressed guards, one on each side of the machine, are used, which press lightly against the outer rolls. By suitable construction one pair of springs keep all the rolls in their true relative position.

Improved Frame for Hot Air Registers.

Edward A. Tuttle, New York city.—This invention consists of an improved method of connecting the interior open work portion of the front or "border" of a hot air register with the outer or marginal portion in a way to simplify the means for fastening it, and facilitate the removal of it whenever it may be desirable to clean out the flue. The invention consists of the openings at the upper ends of flanges, and the arrangement of the upper edge of the open work part, so that when it is placed against the flanges it can be raised behind a lug, and the top wall raised enough for the lower edge to rise over another lug and drop behind it on a lower flange, and thus be held in place by the flanges and the lugs.

Improved Carriage Door.

George Kellner, Paris, France, assignor to Wood Brothers Company, of New York city.—The object of this invention is to provided an improved folding door for that class of carriages which are alternately thrown open and closed, so that, for instance, the changing of a landau or landaulet into a bertin or brougham, and *vice versa*, may be obtained. The invention consists in constructing the door of two sections, the upper half of which is hinged to the lower half, swinging to the inside of the same, both parts being provided with guides for the window. The upper part locks, when thrown open, by means of spring catch at one or both sides, into socket plates of the lower part, and produces thereby a rigid connection of both halves, forming a complete door for closed or open use of the carriage.

Improved Saw Filing Machine.

Walter W. Parsons, Stanstead, Canada.—On the inner end of the shaft of the driving wheel is a short crank which works a pawl to push the filer stock sliding frame along the saw. Under this shaft is another shaft which is geared with it by wheels, so as to turn at the same speed, and it carries a cam which lifts a rocking plate once to each revolution, to hold the file up while the frame is shifted by the pawl. These shafts are so geared that the cam lifts the rocking plate just before the pawl shifts the the frame along.

Machine for Removing Snow and Ice from Roadways.

Charles G. Waterbury, New York city.—A box wider than the space between the rails, and mounted on car wheels, has a furnace at each end. Both are inclosed at the sides and top, and surrounded by a water jacket for containing water for the protection of the walls of the furnace; also for generating steam for driving the fan, propelling the machine, or for use in combination with the fire heat for melting the snow and ice. From the fire grate bars in one furnace extends a plate or wall, inclosing an air box under the grates, into which the air blast is received from a fan, to supply the oxygen for the combustion of the fuel, and to blow the heat over a bridge and down upon the ground. In the other furnace the air blast is delivered on the top of the fire, and passes down between the grates, which are hollow tubes through which the water contained in the jacket circulates for their protection. Hydrocarbon fuel will be used in the furnaces constructed on this plan, either alone or in combination with coal or coke. The machine will be drawn by horses, and be moved fast or slow as needed for the depth of snow to accomplish the work. The heat will also be regulated by the quantity of air blown in by the fans, which may be regulated at will in any of the well known ways.

Tool for Squaring the Edges of Boot and Shoe Soles.

Joshua R. Reed, Baltimore, Md.—This invention relates to modes of evening, smoothing and rendering uniform the edge surfaces of boots and shoes, and consists in a tool peculiarly constructed and adapted to perform this work with great efficiency, and economy of human labor.

Improved Harvester Rake.

John E. Buxton and Thomas I. Howe, Owatonna, Minn.—This invention relates to that class of rakes used upon grain harvesters for the purpose of automatically raking the grain off the platform, transferring it to the rear end on a binding platform and distributing it in gavels of a size suitable to be tied and bound with facility. The invention consists chiefly in the employment, in connection with a rising platform, contracted in width towards its upper end, of a contractible rake which serves to convey the grain to the upper end of the platform on to a binder's table, in gavels ready to be bound.

Improved Baking Pan.

James D. Mason, Baltimore, Md.—This invention relates to attaching a shield or protecting plate to the bottom of the pans for the purpose of preventing the scorching of the dough, and thereby producing a better article of diet. The shield is made detachable so that the pan can be used alone when desired or necessary.

Improved Lubricator for Machinery.

Wm. S. Gillen, Leechburg, Pa.—This invention relates to means for lubricating machinery, by injecting, upon the parts subject to friction, drops of oil or other liquid at regular and short intervals. At every reciprocation of the cross bar on the guides, a stud will strike the end of a lever, unclose a valve, and allow a drop of oil to fall into that part of machinery subject to friction and designed to be lubricated.

Improved Hollow Hand Cutter for Leather, etc.

Abednego Dewes, Hudson City, N. J., assignor to himself and Marcus Hanan, New York city.—This improvement in hollow cutters, for cutting out shapes from leather, cloth, paper, etc., by hand, consists of detachable handles for said cutters, said handles being adapted for several different sizes, the object of which is to save the cost of so many handles. Each handle has four strong arms, branching horizontally from the lower end, to extend over and project beyond the top of the cutter in its long and short axes. A couple of short spring bars for fastening the handle to the cutter are slotted at one end, and meet together at a clamping bolt which passes through the slots, and screws into the center of the bottom of the handle.

Improved Bee Hive.

Hyram F. Bobo and Phillip F. Johnson, Trezevant, Tenn.—The bottom slides in and out upon cleats attached to the sides, and its forward part projects in front of the hive, to serve as a platform for the bees to alight upon, and as a handle for drawing out and pushing in said bottom. Upon the upper side of the forward part of the bottom, and in line with the doors when closed, is attached a narrow board through which is formed the opening for the bees to pass in and out. To the upper side of the rear end of the bottom is attached a board which projects upward nearly to the horizontal partition that separates the brood chamber from the honey box, and to which the comb frames are hinged, so that, when the said bottom is drawn out, the frames may be swung aside to allow the comb of any particular frame to be examined. The forward ends of the comb frames of the honey box are kept at the proper distance apart by a notched bar placed upon them.

Improved Saw Gumming Machine.

David Boyd, Vevay, Ind.—This invention consists in a mandrel, carrying a cutter and provided with a screw thread at one end, so as to adapt it to receive a rotary and progressive or longitudinal movement; also a curved ball mounted on the cutter mandrel, and provided with a wedge which operates in concert with friction rollers for imparting a lateral movement to the cutter mandrel. The machine is designed for gumming large circular saws without removing them from their arbors. It will be found fully described and illustrated on page 150 of our current volume.

Improved Plow.

Harvey Blue, Medina, Wis.—To the forward part of the beam are attached two brackets, which carry a wheel which receives motion from contact with the ground. To the projecting ends of the journals of the wheel are attached cranks projecting in opposite directions, and to which are pivoted connecting rods. The rear end of one connecting rod is pivoted to a crank arm formed upon a hook which is pivoted to the side of the beam over the plow point. The hook passes down in front of the upper part of the colter of the plow and oscillates laterally to keep the colter free from rubbish. The other connecting rod communicates with mechanism, so that the forward movement of the plow may oscillate a bar longitudinally with the plow to keep it free from rubbish.

Improved Clothes Line Attachment.

Dwight W. Smith, Fox Lake, Wis.—This invention provides a convenient means for disposing of clothes for drying after being washed, and to avoid the tedious operation of hanging out the clothes in the ordinary way in the open air; and it consists in metallic supports or eyes attached to the clothes line, by means of which the line, with clothes attached, may be suspended from hooks in the wash room, and then detached and carried to the yard, and again suspended from hooks on the clothes line posts. The supporting eye is made of non-corrosive metal, having two tubes for the line. Through the lower one the line passes twice.

Improved Roofing Tile.

Garry Manvel, Rochester, N. Y.—This invention consists in a tile and cement roof, made of tile having the overlapping rib along one edge, a groove along the other edge, and the rabbet and notch in one end, arranged and connected together, the joints being cemented.

Device for Lubricating the Journals of Car Axles.

Philip Bauer, Manchester, England.—Upon the bottom of the oil receiver, and nearly in the same vertical plane with the axis of the axle journa above, are two perpendicular cylindrical sockets, which receive two spira springs. Above the upper ends of the guides is a horizontal plate, resting on the journal box, and slotted transversely in the center. Through the slot plays a flat faced disk or feed wheel. The upper parts of the circumference of the feed wheel press against the under side of the journal, and the lower dip into the oil or lubricant placed in the receiver, such lubricating material rising, by preference, no higher in the receptacle than the axial pivot of the aforesaid feed wheel. When the axle rotates, the journal, by its slight frictional contact with the feed wheel, communicates a corresponding movement thereto; whereupon oil from the oil receiver, adhering to the flat (transversely considered) face or periphery of the feed wheel as it passes through the receiver, is carried upward and over and in contact with the surface of the journal. The feed wheel is arranged to work through a central slot in a leaf spring, the ends of which are placed upon suitable fixed supports, with sufficient tension in the spring itself to keep the feed wheel continually pressed up against the journal. The agent for this invention is Mr. Charles G. Wolff, 44 Exchange Place, New York city.

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George R. Barker's Heating and Ventilating Apparatus, illustrated in this paper Feb. 14, may be seen in operation at the Franklin Institute, Seventh Street, above Chestnut, Philadelphia, Pa.

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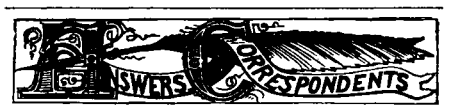

W. H. N. will find directions for hardening steel tools on p. 75, vol. 28. Steel points are sometimes used for scratching glass.—H. E. B. and L. C. F. will find directions for producing a polish on shirt fronts, etc., on p. 114, vol. 24.—C. L. C. can make tracing paper by the process described on p. 241, vol. 28.—E. will find practical directions for constructing and fixing lightning rods on p. 248, vol. 26. Read Noad's "Student's Manual of Electricity."—S. L. S. will find directions for preserving crayon drawings on p. 53, vol. 27. As to the other question, apply to a stationer.—C. D. will find explanations of sirup turning tea black on p. 171, vol. 30.—C. H. will find a recipe for a cement for glass letters on p vol. 27.—H. P. S. will find descriptions of magnets on p. 41, 26, vol. 24.—D. W. S. will find directions for coating iron with copper without a battery on p. 155, vol. 26.—J. McE. can try to temper saw blades for cutting iron by following the instructions on p. 16, vol. 24.—D. S. will find recipes for all kinds of solder on p. 251, vol. 28. Walnut wood can be stained by the process described on p. 314, vol. 25. Browning gun barrels is fully detailed on pp. 154, 266, vol. 26.—E. A. C. will find instructions for skeletonizing leaves on p. 267, vol. 25, and for stuffing birds and other animals on p. 362, vol. 27.—F. R. B. should consult our advertising columns for booksellers' addresses.—A. S. H. will find a recipe for waterproof glue on p. 202, vol. 28.—M. A. H. is informed that the difference between 12 inches square and 12 square inches is 132 square inches.—A. B. D. will find explanations of the mock sun phenomena on pp. 132, 171, vol. 28.—L. C. will find directions for cleaning inking rollers on p. 348, vol. 26.—F. P. D. will find a recipe for black finish on optical instruments on this page.—N. B. D. and Q. H. B. will find directions for waterproofing canvas on p. 122, vol. 27.—E. A. R. will find a recipe for fine blacking on p. 73, vol. 26.—G. W. C. should apply to a maker of emery wheels.—P. K. will find a recipe for bronze dip on p. 58, vol. 26.—J. R. C. and J. K. M. will find the needed particulars of the Australian fever tree on p. 103, vol. 30.—J. N. is informed that we have no record of any finer spinning than the one he mentions.

C. P. T. says: I have a steam boiler of 100 horse power, with pipes from cistern 10 feet, deep double valve in pump, check valve near boiler, and direct valve between check and boiler. I find that, after stopping every night, if the direct valve is not closed, the boiler will fill itself full of water. Will you please tell me the cause? A. The steam in the boiler condenses; and a vacuum being formed, the water is drawn up. Leave a gage cock open at night, if it is not convenient to close the direct valve.

G. W. L. asks: What is the difference between coal and wood in the amount of steam furnished? A. A tun of coal is supposed to be equal to 1½ cords of good wood. As regards the steaming capacity, it will depend considerably on the construction of the furnace. So far as we know, the boiler mentioned is a fair specimen of the sectional variety.

W. asks: In what manner does the mode of propelling boats, described in your issue of January 24 as the invention of Mr. J. T. Bowman, of Texas, differ from that tried in the British navy, and which was so highly thought of by the late Admiral Farragut? It was applied, if I remember rightly, to a boat named the Waterwitch, and in principle, as I think, was the same method as Mr. Bowman's. A. Judging from the description, Mr. Bowman's plan only differs, from that fitted in the Waterwitch, by having three openings for the discharge of water instead of two, a difference which is probably unimportant.

G. S. G. asks: Does the steamboat law compel me to have a registering steam gage, lock valve, life preservers, axes, hose, and all the other appliances, and licenses for engineer and captain, on a small steam launch 21 feet long, used on a river? I claim that a boat too small to register, used only for the owner's pleasure, is not expected to comply with the law. Am I correct? A. We think that you are right.

A. C. asks: 1. How large and how long a stroke, and what size bore would be the best proportions for a small slide valve engine for a boiler 13 inches in length x 14 inches in diameter, with 5 two inch flues, made of iron of sufficient strength to stand a working pressure of 50 lbs. to the square inch? The sides of the furnace are sheet iron tanks, so that the feed water will be boiling hot when injected. What horse power would it have at 15 revolutions per minute? A. You can make a cylinder about 4 inches diameter and of 6 inches stroke; and under the conditions mentioned, it will develope about 3-16 of a horse power. 2. I have heard it stated that the mouth of the Mississippi river was actually 300 feet higher than its source, the centrifugal motion of the earth's rotation forcing the water towards the equator. Is this so? A. The mouth of the Mississippi is further from the geographical center of the earth than the source is, so that in this aspect the river runs up hill. The mouth, however, is below the surface of equilibrium due to the rotation of the earth, so that the water flows from the source to the mouth, to fill up to the proper level.

N. C. O. asks: If a boat with enormous paddle wheels were anchored in a strong stream, would not a forcesid stream put the paddles and some machinery in motion? Is this an old idea, or worth a patent? A. The device is very old. See p. 229, vol. 29.

W. J. asks: 1. Why is it that a forked switch, held with crotch up, will in the hands of some persons turn down in crossing certain places, while with others it will not turn? A. It will not do it. 2. Is there any means or instrument by which one can tell without digging where there is a vein of water in the earth? A. No.

F. A. R. says: On p. 28, vol. 30, I saw a recipe for making a deep black ink. So I procured the articles as named, but could not get the Aleppo galls. I got instead nut galls, the same quantity, but the ink is not so black as expected. Would a larger quantity of the same be necessary, or will they not answer the purpose at all? A. The percentage of tannic acid, which is the substance contained in nut galls that is essential to making ink, varies in nut galls, and those you obtained are probably inferior to Aleppo galls. But a larger quantity ought in this case to yield more tannic acid and a better ink.

J. H. G. asks: What are the chemical symbols for the following: Lard, white wax, camphor, borax, alkanet root, rose oil, heliotrope oil, orange flower oil? A. Lard consists of olein C_{114} H_{104} O_{12}, margarin, C_{108} H_{104} O_{12}, and stearin, C_{114} H_{110} O_{12}. White wax: C_{108} H_{108} O_4. Borneo camphor: C_{20} H_{18} O_2. Laurel camphor: C_{20} H_{16} O_2. Borax: NaO, $2BO_3$+10HO. Alkanet root, rose oil, heliotrope oil, and orange flower oil are each composed of a number of substances, and have no chemical formulæ of their own.

J. H. C. asks: Will you tell me how to prepare bones to make charcoal, suitable for sugar refiners, filters, etc.? A. The bones are treated with sulphide of carbon, which dissolves the fat to the amount of 5 or 6 per cent of the weight of the bones. This fat may be recovered from the sulphide of carbon, and the latter used over again.

E. G. A. asks: 1. How can I make a silver solution for plating with a galvanic battery? A. Dissolve 2 parts of cyanide of silver and 3 parts of cyanide of potassium in 250 parts of water. 2. What length of time should a watch case be left in the solution to receive a coating sufficient to wear for two years? A. The time depends upon the strength of the galvanic current. 3. How should the wire be connected with the battery and the article to be plated? A. The watch is to be connected with the zinc plate by a wire dipping into the solution, and opposite to it a small strip of silver connected with the carbon plate.

J. E. H. says: I have been trying to make a flexible non-elastic airtight bag to hold 15 or 20 lbs. pressure to the square inch. I made a bag of strong, closely woven cotton, putting the seams together with rubber cement, and then coated it 2 or 3 times with pure rubber dissolved in naphtha, but it was not entirely satisfactory. 1. Is rubber perfectly impervious to air? A. No. 2. How thick do you think the rubber ought to be to hold 20 lbs. pressure, provided the stuff is strong enough to keep it from bursting? It is very desirable to have it as light as possible. A. One twelfth of an inch of pure rubber. 3. Is there any composition that would serve the purpose better? A. No. 4. Would the heat or perspiration of the body have any effect on rubber in the course of time? A. Probably it would.

W. L. C. asks: Will kerosene oil dissolve or soften the ordinary rubber packing after any length of time? A. It probably will.

A. asks: 1. In the present theory, is light considered a non-elastic fluid? A. Light is supposed to be a wave-like motion of a subtle elastic substance which fills all space, termed ether. 2. What is the best way to remove superfluous hair? A. By pulling. 3. Can it be permanently removed? A. Yes, by the application of substances that will burn or remove the hairy surface of the skin.

T. L. S. asks: How can I make a wash or paste which I could dip dried beef into, to keep it from the air and flies? It must be something that will not injure the meat for eating, and that will not dissolve by moisture or slight heat, and that will not crack off. A. Try immersing the beef for a very short time in a bath of melted paraffin.

F. G. K. asks: What is the cause of the variation of the sun's rays as they strike any meridian? Why is the sun not in a plane with the meridian at 12 o'clock noon at all times in the year? A. The difference is caused by the eccentricity of the earth's orbit, the obliquity of the ecliptic, and the perturbations due to the moon and planets. For the *Nautical Almanac*, write to United States Observatory, Washington, D. C.

I. R. M. says: I have found quite a difference in the weights of hard burned and soft burned bricks, the hard burned bricks being the heavier. Why is this? A. They have probably taken up more foreign matter from the fire to which they were exposed.

S. S. F. asks: Can a hole be made through a pane of glass by means of the sand blast, without breaking the glass? A. Yes.

A. S. asks: 1. How can I make models for small castings? A. Use fine sand or plaster of Paris. 2. How can I prepare a metal that will polish and can be melted over a charcoal fire? A. Brass composition will answer.

C. Bros. ask: What is the matter with our boiler? We have a 45 flue boiler, 14 feet long, running a 30 horse power engine. Having been in use some eight years, we recently took out all the flues, and cleaned and replaced them, washing out the boiler with soft soap and water, and, as we supposed, thoroughly cleaning it with clear water. When we fired up again, we had little trouble in raising steam for 4 days, when we were unable to raise over 24 lbs., the engine not running; and on opening throttle, it immediately all vanished. All this time we had a heavy coal fire under boiler. Will foaming in boiler cause this difficulty? Is it impossible to raise much steam from some kinds of water? A. It may be that the soap was not removed, and formed a scale. If this be the case, by blowing out a considerable quantity of water twice a day, you may remedy the trouble. You will understand that this is only a surmise on our part, and we think it would be better for you to refer the matter to a reliable engineer who can make an examination.

G. U. asks: How are boxwood rules and steel standards marked? By what mechanical means is the accuracy obtained? A. They are graduated by means of a dividing engine, the divisions being made with a suitable tool.

W. J. says: On p. 123, vol. 30: "Is there any instrument that will detect the presence of a metal in the earth?" You answer: No. I think you are mistaken, or at least a gentleman in this county professes to find lead, silver, and gold with an instrument. A. We are aware that there are individuals who profess the possession of such instruments. The presence of iron ore beneath the ground may in some cases be detected by the use of the magnetic needle. But as for gold, silver, lead, and other metals, no instrument capable of indicating their presence is known to science.

J. P. asks: What is the best pump for a well of 40 feet depth? Will a chain pump answer for that depth? A. Yes.

C. R. asks: What is hydrochlorate of aniline? A. It is made by combining aniline with muriatic acid. Your specimen did not come to hand.

W. G. asks: I. What is the elastic hand stamp made of? A. Rubber. 2. Is there a book published on all kinds of dyeing, weaving, and dressing cloth? A. You will find such books described in the catalogue of a scientific publisher. 3. Is there a journal on woolen machinery and manufacturing of wool, etc.? A. No. 4. I have a circular saw for sawing logs 44 inches in diameter and running 450 revolutions per minute, from a 40 inch double turbine water wheel, under 12 feet head and fall. I contend that, if I double the revolutions per minute of the saw, I shall double its force. Do you think that I shall gain any power? If so, how much? A. If the wheel is powerful enough, the saw should do double the work under these circumstances. 5. A schoolmaster took thin writing paper and dipped it into a yellow liquid; he placed a card with a picture on its surface against the saturated writing paper, and then put them between a couple of panes of window glass, and placed the whole in the sunbeams. In a few minutes, the picture was beautifully copied on the yellow paper. What was the liquid? A. A solution of bichromate or potash, probably.

H. L. G. asks: 1. How can I construct a cheap electrical machine? A. By using a large glass bottle for the cylinder of the machine, and coating the prime conductor with tin foil. 2. How are the batteries used by physicians made? A. Some are made of plates of zinc and carbon immersed in dilute sulphuric acid.

J. B. asks: What will be the result of the constant meteoric accumulations on the surface of the earth? The weight and bulk of our planets are being constantly increased, and if things go on as at present the doubling of the earth's weight and bulk is only a question of time. A. The moon would fall to the earth and the earth reach the sun in a shorter time. Mr. Proctor estimates the earth's present supply of meteorites at one inch in depth in 400,000 years.

A. asks: 1. Can you give me a plan for constructing a cheap telescope, consisting of two double convex lenses with a power of 36 times, without using an achromatic lens? Could I use a double convex lens, 5 inches in diameter with a focus of 72 inches and an eyeglass 1 inch in diameter with a focus of 2 inches? A. Cheap telescope tubes may be made in four ways: 1. By rolling pasteboard, covered with paste or glue, on a wooden mandrel; remove to dry, and varnish inside and out. 2. By gluing together wooden strips an inch wide over hoops. 3. Roll tightly, with glue upon a mandrel, strips of second quality veneering. Each layer must be kept in place, as glued, by a cover of canvas strapped very tight. 4. Use sheet or tinned iron, the best method. The fittings for the object glass cell and eyepiece tube are turned brass castings. A six inch crown lens was used by Zöllner for observing solar protuberances. For other objects, such a lens cannot be used to advantage.

O. says: What are the astronomical names and probable distances from our globe of three fixed stars, familiarly called the triple twins? They arrive over the meridian line at about 8 o'clock P. M., and about 45° above horizon, preserving equal distance apart and in a right line. A. The three stars you mention are *Delta*, *Epsilon*, and *Zeta*, in the belt of *Orion*. They are about the second magnitude; *Delta* and *Epsilon* are double stars, while *Zeta* is triple.

C. A. C. asks: 1. Can alcohol be frozen? A. Alcohol has never been frozen, though, when cooled to a temperature of 166° below zero, it becomes viscid. 2. Is there any premium offered by any government or exposition for a varnish that will prevent wire from rusting and will not crack off while being bent? A. We never heard of such a reward.

G. R. E. asks: Is there anything that I can throw into a privy vault that will remove the offensiveness? I would like to use the soil as manure. If the upper part is filled with dry earth, would it settle and answer the purpose? A. The dry earth would fill up the well, but would be offensive. Copperas mixed with half its weight of lime would perhaps answer your purpose of removing the odor and permitting the product to be afterwards used as a manure.

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H. W. S. asks: 1. How can I plate brass or copper with silver without a battery? A. Mix chloride of silver 1 part, pearlash 2 parts, common salt 1½ parts, and whiting 1 part. Rub the mixture well on the surface of the brass or copper (previously well cleaned) with a piece of soft leather, or cork moistened with water and dipped into the powder. When silvered, wash the metal in hot water slightly alkalized and wipe dry. 2. With what solution can I clean the articles before plating or galvanizing? A. In silver plating, the articles to be plated are first carefully freed from grease by boiling in a solution of potash, then quickly dipped in red nitrous acid to remove any oxide, and afterwards well washed in water to remove all traces of acid. If the surface be amalgamated, the adhesion of the silver will be promoted. In galvanizing, the iron is first dipped in dilute sulphuric acid to remove the oxide on the surface.

M. E. says: 1. A friend informs me that ice brought from Boston, exposed in the sunlight, will last one third longer than southern ice. Is this so? Does the ice absorb cold after freezing? A. Trials have been made of natural ice and that frozen artificially by various ice machines, with reference to their lasting qualities, and the latter were found to take longer time to melt. This is probably due to the fact that artificial ice has been frozen at and reduced to a lower temperature than the natural material. The crystallization may also, at a long continued low temperature, be more compact and render the ice more firm, as what is known as snow ice is very perishable. After water has congealed at 32°, the ice formed may be reduced like any other solid to any low degree of temperature; and ice being a bad conductor of heat, it (compared with some other solids) takes a long time for the mass to receive an accession of heat from without. These remarks may serve to explain the difference between Boston and southern ice, the former being probably frozen at a lower temperature than the latter.

J. W. H says: I have a common wooden pump with its valve bucket about six feet below the level of the ground, being attached to the pump handle by a rod nearly nine feet long. During cold weather, the water in this pump froze, and I have reason to believe that the pump was full of solid ice from the spout down to the valve bucket, which is about eight feet. I first tried to thaw it out with hot water, but found that made but little impression; so I poured in about one quart of hard coarse salt. I soon found the ice was melted down about two feet below the spout. Twelve hours afterwards, it had melted nearly four feet, and the next day the pump was all free of ice and works as well as ever. Nearly all the time the mercury has been below zero. Will you inform me why cold salt will melt ice in cold weather? What chemical action, if any, takes place with the salt and ice? A. Whenever a solid body passes into the liquid state it absorbs heat, and the heat which is thus absorbed is called latent or hidden heat. When it passes back again from the liquid to the solid state, this heat is again given out and called sensible heat. The particles of salt find their way into the pores of the ice; and since the point of freezing of a mixture of ice and salt is many degrees below that of ice alone, the mixture becomes liquid and in passing from the solid to the liquid state must absorb heat. Finding no source to take it from, its temperature falls until the liquid is 32° colder than the solid ice and salt.

A. R. W. asks: To how many degrees of heat must iron be raised to weld it? A. According to Siemens, the welding heat of iron is 2,700° F.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated:

E. L. F.—Iron pyrites, with rounded pebbles of quartz.

J. W.—Carnelian, but are not brightly enough colored to be of value.

H. B. S.—Magnetic iron ore, and is good for making iron.

R. J. L.—Your material is clay, which might prove useful in the potter's art.

W. R. E.—Your specimen is not black lead, but sulphuret of lead, and is distributed through quartz,

N. D. M. Iron pyrites.—It does not indicate coal, although it is sometimes found with coal.

J. P. D. asks: What will soften copper wire so as to work as readily as lead? Can I soften the wire to any degree of temper?—J. F. H. asks: How can I make bungs, cut across the grain of the wood?—W. E. C. asks: What are the ingredients used to increase the adhesive properties of sugar or molasses in making popcorn balls, and what is the process of making the same?—J. C. asks: What is the best bait for enticing rats into a trap? Is there any chemical preparation that will draw them?—J. B. G. asks: Is there any way to prevent the slacking of stone coal? We lay in fuel in the fall, in good sized lumps; before spring much of it is useless.—J. O. T. asks: How can I prevent an ivory flute head from cracking, and how can I stop the cracking after it has commenced?—S. asks: How is a steely luster given to the surface of black glass? I have seen polished black glass, with a very thin coat (of platinum or bismuth, I think) which nitric or muriatic acid does not affect. Fluoric acid raises it from the surface in bubbles. It is not an enamel burnt in, as that would destroy the facets on the glass, which show the polishing marks through this thin coat.—M. S. W. asks: 1. How is contraction of a horse's hoof produced? 2. How can I prevent contraction of the hoof? 3. On what part of the horse's leg does contracted hoof operate, to make the horse lame?—W. H. G. asks: Can you give me directions for the treatment of green moss, to prepare it as an article of commerce? There are two different processes, one in which the moss is soaked in water until it is sufficiently rotted, and another in which this result is secured by the use of chemicals.—L. F. S. asks: How did B. N. C. (see your issue of January 24) arrange his pulley to carry power from the drum on main line to his lathe? How was the pulley thrown out of gear? Could such a friction gear carry as much as 25 horse power?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On East Tennessee Industries. By H. E. C.
On the Centralization of Matter. By J. P.
On a Steam Buggy. By F. G. W.
On Poisonous Aniline Dyes. By J. E.
On Ventilation. By G. N.
On the Northern Lights. By J. R.
On Wood Engraving. By H. C. F.
On the Non-Actinic Rays of Light. By E. J. H.
On Glue as a Healing Remedy. By E. P.
On a New Breech Blight. By J. S.
On Coal Oil on Railroads. By G. H. K.
On Mental Arithmetic. By J. P.

Also enquiries from the following:

W. F.—J. T.—A. C. G.—W. E.—J. R. & Co.—H. W. T.—P. W. L.—J. B. G.—P. M.

Correspondents in different parts of the country ask: Who makes steel bars, to be used instead of bells? Who sells horse clipping machines? Who makes microscopes, sufficiently powerful to detect the *animalculæ* in water? Who sells a rubber preparation in imitation of mahogany and rosewood? Who buys potato flour? Who sells hair cloth? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

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WERE GRANTED IN THE WEEK ENDING

February 17, 1874,

AND EACH BEARING THAT DATE.

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Hanger and loose pulley, adjustable, Thayer *et al* 147,529
Harness hame, J. Letchworth 147,507
Harp, G. D. Reed 147,689
Harvester cutter, Blood *et al* 147,549
Harvester elevator, C. G. Crosse 147,483
Harvester rake, Buxton *et al* 147,477
Harvester rake, A. Wemple 147,583
Hat frames, binding and wiring, H. A. Whiting 147,724
Hay, etc., machine for raking, J. Trout 147,713
Heater, boiler feed, E. P. Fenn 147,624
Hinge, lock, F. Walker 147,715
Horse power, D. Landes 147,659
Horse trapping, F. Bernsee 147,471
Hose coupling, W. M. Henderson 147,498
Hubs to axles, attaching, D. A. Johnson 147,503
Indicator, station, A. C. Bragonier 147,474
Instep pad, J. B. Smith 147,698
Iron and steel, welding, H. Schierloh 147,576
Iron for rolling, sheet, T. James 147,502
Journal and bearing, O. B. Morse 147,678
Journal box, W. D. Baxter 147,546
Kaleidoscope, J. Collicott 147,480
Kiln, drying, G. I. Weigelin 147,718
Knife-sharpening steel, O. W. Taft 147,705
Knitting burrs, oiling, J. Maxwell 147,672
Lasting tool, P. H. Howe 147,640
Latch, mortise door, A. D. Judd 147,560
Latch, reversible knob, J. Arbeiter 147,467
Lime, putting up chloride of, M. L. Bush 147,476
Lock, hasp, J. H. Runyan 147,694
Lock, seal, F. W. Brooks (r) 5,765
Lubricator, S. C. Hamlin 147,636
Mains, tapping, L. Spaulding 147,700
Mandrel, spring coiling, Nichols *et al* 147,679
Medical uses, electrode handle for, J. Kidder 147,650
Mill, grinding, R. S. Cathcart 147,605
Millstone dress, I. Yearsley 147,733
Mill relief device, T. Shaw 147,521
Molders' flask, T. Insull 147,641
Motor lever, J. Stone 147,703
Mud fender for equestrians, A. B. Speed 147,701
Necktie, R. R. Parker 147,682
Nut lock, T. B. Wrigley 147,510
Ores, treating, C. H. Aaron 147,542
Organ, reed, A. F. Yarwood 147,732
Organs, reed board for, Cheney *et al* 147,608
Packing, piston, A. E. Baker 147,543
Packing, piston, H. A. Jamieson 147,643
Padlock, H. Ahrend 147,585
Paper box, L. W. Beecher 147,547
Paper box, L. W. Beecher 147,548
Paper box, F. W. Smith 147,697
Paper clip, A. D. Judd 147,561
Paper pulp screen, etc., J. S. Warren 147,717
Paper pulp washer, C. J. Bradbury 147,595
Pen, fountain, W. E. Thomas 147,707
Photographic screen, A. M. Bird 147,594
Photographs, enameling, N. Weston (r) 5,766
Picture frame, J. W. Taft 147,528
Planing machine, metal, W. Henderson 147,497
Planter, seed, E. G. Matthews 147,671
Planter, seed, T. Pressly 147,686
Plastering board for walls, etc., L. H. Tideman 147,531
Plow jointer, H. Gale 147,629
Pocket book, E. A. Hemphill 147,639
Printers' roller composition, J. H. Osgood 147,569
Printing press, folder for, J. B. Molyneaux 147,568
Pulley, differential, J. N. Floyd 147,625
Pump barrels, etc., coupling for, J. S. Barden 147,545
Purifier, flour and middlings, G. W. Brown 147,598
Purifier, middlings, D. S. Mackey 147,565
Purifier, middlings, O. A. Pray 147,683
Radiator and damper, combined, O. Baldwin 147,544
Railroad axle lubricator, Wendell *et al* 147,719
Railroad gate, W. J. Garrison 147,495
Railroad signal, pneumatic, W. Robinson 147,692
Railroad switch, S. R. Kneeland 147,655
Railroad switch, C. C. Shelby 147,695
Railroad switch, C. C. Shelby 147,696
Railway tie, Kendrick *et al* 147,563
Rake, horse hay, W. X. Stevens 147,702
Range, heating, I. J. Baxter 147,592
Razor, G. A. Whitmarsh 147,725
Regulator, fluid pressure, D. T. Casement 147,604
Roofing material, J. N. Colby 147,610
Saddle, harness, K. Frazer 147,627
Saddle, harness, S. A. Marker 147,509
Safes, water tank for fireproof, E. H. Parker 147,681
Sash fastener, E. Overton 147,570
Sash holder, A. L. Whitney 147,726
Saw, W. Clemson 147,609
Saw-filing device, A. P. Durant 147,488
Saw jointer, E. Gowdy 147,631
Saw mills, log turner for, E. H. Stearns 147,523
Scale beam, C. H. Miller 147,512
Screw driver, S. R. Kneeland 147,654
Sewing machine cabinet, G. Range 147,572
Sewing machine caster, L. L. Robinson 147,574
Sewing machine table, J. M. Baird 147,469
Sewing machine treadle, A. B. Shaw 147,578
Shaft coupling, F. W. Verharen 147,714
Shaft coupling, R. Whetherill 147,720
Shaft-holding attachment, J. H. Adams 147,465
Sharpening machine, B. D. Whitney 147,586
Sheet metal vessel, P. Lesson, (r) 5,770
Shirt bosom protector, T. J. Richards 147,573
Shirt bosom supporter, T. L. Dalton 147,484
Shirt collars, etc., making, P. D. Aub 147,588
Shoe, J. H. Vermilya 147,533
Sofa and bedstead, M. L. Perry 147,683
Soldering machine, can, W. D. Brooks 147,596
Soles and heels, burnishing, A. C. Carey 147,551
Spindle, lubricating, J. & C. C. Wilson 147,537
Spinning stop mechanism, etc., G. Krainik 147,657
Spinning mule, self-acting, N. W. Bancroft 147,590
Spinning spindle and bobbin, N. I. Allen 147,466
Spool box, B. F. Carpenter 147,601
Stair hand rails, joint for, W. Leduc 147,659
Stamps, canceling, Goff & Hursy 147,630
Stanchion, H. Willard 147,727
Steam or water gate, S. Van Horn 147,532
Stone, hardening, D. M. Sprogle 147,522
Stone slabs, polishing, J. Finn 147,490
Stove, cooking, Z. Hunt 147,500
Stove, cooking, Z. Hunt 147,501
Stove, fire place, H. L. McAvoy 147,673
Stove, railroad car, J. Wilson 147,729
Surveying instrument, J. L. Bogy 147,472
Suspenders, J. W. Wattles 147,582
Table, dining and ironing, L. Berner 147,470
Table, drawing or writing, J. A. Knight 147,504
Tablet, erasive, C. N. Brown 147,597
Teas, coffees, etc., chest for, G. Lillibridge 147,661
Telegraph, duplex, G. D'Infreville 147,487
Telegraph, duplex, J. B. Stearns 147,524
Telegraph, duplex, J. B. Stearns 147,525
Tenoning machine, W. H. Elliott 147,554
Tobacco cutting machine, J. F. Kelley 147,562
Toilet case, pocket, G. Wunderlich 147,731
Towing canal boats, etc., T. J. O'Toole 147,680
Toy, automatic, G. W. Brown 147,475
Toy dancer, automatic, W. L. Hubbell 147,558
Toy locomotive, E. C. Phelps 147,516
Tubes, pile for rolled, E. Wheeler 147,721
Umbrella, Harrison & Pearson 147,638
Umbrella, folding, Phillips & Burnham 147,517
Valve, check, M. T. Davidson 147,614
Valve gear, steam engine, A. S. Cameron 147,478
Valve seats, refitting, W. W. Allmand 147,586
Valve, steam engine, J. D. Bown 147,736
Valve, stop, B. F. Wilson 147,584
Vehicle spring, J. Curtis 147,613
Vehicle spring, J. E. Jeffrey 147,644
Vehicle wheel, W. Crandell 147,611
Vehicle wheel, W. W. Crane 147,482
Vessels, raising sunken, H. F. Knapp 147,653
Wagon, dumping, H. Bailey 147,468
Washing machine, D. Graham 147,632
Water closet for vessels, A. B. Sands 147,575
Water closet regulator, J. Marquis 147,510
Windmill, M. J. Kauffmann 147,687
Window screen, A. L. Fuller 147,494
Wrench, L. F. Smith 147,699

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

28,378.—FIRE ESCAPE.—L. King. May 6.
28,389.—RUBBER TUBING.—T. J. Mayall. May 6.
28,402.—ICE CREAM FREEZER.—C. W. Packer. May 6.
28,469.—HORSESHOE.—R. A. Goodenough. May 13.
28,684.—CORN PLANTER.—D. C. Myers. May 27.

EXTENSION GRANTED.

27,241.—PHOTOGRAPHIC CAMERA.—A. Semmendinger.

DESIGNS PATENTED.

7,168.—BARBER'S CHAIR.—A. Abel, New York city.
7,169.—GLASSWARE.—T. B. Atterbury, Pittsburgh, Pa.
7,170.—ADVERTISING DESK.—L. W. Burton, Syrabuse, N. Y.
7,171 to 7,178.—CARPETS.—R. R. Campbell, Lowell, Mass.
7,179.—SWING SEAT.—G. De Nottbeck, New York city.
7,180.—INSECT CASE.—G. De Nottbeck, New York city.
7,181.—BOTTLES.—E. R. Durkee, Brooklyn, N. Y.
7,182.—CARPET.—J. Hamer, Lowell, Mass.
7,183.—TOBACCO BOX.—C. J. Hauck, Brooklyn, E. D., N. Y.
7,184.—BANK BILLS.—W. B. Hotchkiss, New York city.
7,185.—CARPET.—D. McNair, Lowell, Mass.
7,186.—GLASS TUMBLERS, ETC.—T. W. Mellor, Phil., Pa.
7,187 to 7,189.—OIL CLOTHS, ETC.—C. T. Meyer & V. E. Meyer, Bergen, N. J.
7,190.—CANISTERS.—J. H. Preater, Brooklyn, N. Y.
7,191.—PEN RACK.—F. R. Seidensticker, Meriden, Conn.
7,192.—WAITER.—H. C. Wilcox, West Meriden, Conn.

TRADE MARKS REGISTERED.

1,634.—BRAID.—D. Goff & Son, Pawtucket, R. I.
1,635.—TOBACCO, ETC.—E. H. & W. H. Hamman, Emaus, Pa
1,636.—WHISKY.—G. W. Kidd & Co., New York city.
1,637.—HEEL COUNTERS.—J. Kimball, Boston, Mass.
1,638.—FERTILIZER.—Lorentz & Co., Baltimore, Md.
1,639.—PENS.—W. F. Murphy's Sons, Philadelphia, Pa.
1,640.—CARPETS.—R. Scott, Philadelphia, Pa.
1,641.—MEDICAL COMPOUND.—P. P. Van Alstine, Barnesville, Ga.
1,642.—ILLUMINATING OIL.—Warden & Co., Pittsburgh, Pa.

SCHEDULE OF PATENT FEES.

On each Caveat	$10
On each Trade Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On application for Design (7 years)	$15
On application for Design (14 years)	$30

[Specially reported for the Scientific American.]

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA.

FEBRUARY 20, 1874.

3,114.—J. Tufford, Beamsville, Lincoln county, Ontario Improvements on machine for drilling iron or steel called "Tufford's Improved Drilling Machine." Feb 20, 1874.

3,115.—G. B. Getty, E. Mendenhall and E. Barton, all of Bloomsburg, Columbia county, Pa., U. S. Improvements on head blocks for circular saw mills, called "Getty's Improved Head Block for Saw Mills." Feb 20, 1874.

3,116.—H. R. Barnes, Rock Stream, Yates county, N. Y. U. S. Improvements on hoes, called "The Barnes Hoe." Feb. 20, 1874.

3,117.—Jas. Defoe, Detroit, Wayne county, Mich., U. S Improvements on wood pavements, called "Defoe's Wood Pavement." Feb. 20, 1874.

3,118.—Jas. Tredale, Toronto, Ontario. Improvements on coal oil stoves and lamps, called "Tredale's Portable Coal Oil Stove." Feb. 20, 1874.

3,119.—W. M. Mixer, New York city, U. S. Improvements in refrigerator buildings, called "Mixer's Preserving House." Feb. 20, 1874.

3,120.—S. R. Wilmot, Bridgeport, Fairfield county, Conn., U. S. Improvement on sheet metal tubing, called "Wilmot's Improved Lock Seamed Tubing." Feb. 20 1874.

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3,121.—S. R. Wilmot, Bridgeport, Fairfield county, Conn., U. S. Improvements on the manufacture of metal tubing, called "Wilmot's Improved System of Manufacturing Metal Tubing." Feb. 20, 1874.

3,122.—J. A. Whelpley, Dartmouth, Halifax county, Nova Scotia. Improvements on skates, called "Whelpley's Self Fastening Skates." Feb. 20, 1874.

3,123.—J. J. Thomas & E. G. Thomas, Hamilton, Ontario. A railway switch, called "Thomas' Automatic Safety Railroad Switch." Feb. 20, 1874.

3,124.—J. Mills, Keeseville, Essex county, New York, U. S. Improvements on horse shoe nail machines, called "Mills' Improved Horse Shoe Nail Machines." Feb. 20, 1874.

3,125.—T. Rose, Georgetown, Halton county, Ontario. Useful article for cleaning lamp glasses, called "Rose's Spring and Slide Lamp Glass Cleaner." Feb. 20, 1874.

3,126.—L. M. Stockton, Yarmouth, Elgin county, Ontario, and D. Stockton, same place. Useful tanning composition to tan cow or any other hides, called "Manuel's and Stockton's Tanning Composition." Feb. 20, 1874.

3,127.—W. Foglesong, Dayton, Montgomery county, O., U. S. Improvements on machine for making sheet metal pans, called "Foglesong's Sheet Metal Pan Machine." Feb. 20, 1874.

3,128.—D. Douds, J. H. Hartsupp and P. Douds, all of New Castle, Lawrence county, Pa., U. S. Improvements on steam pump, called "Doud's and Hartsupp's Steam Pump." Feb. 20, 1874.

3,129.—G. Westinghouse the Younger, Pittsburgh, Allegheny, Pa., U. S. Improvement on a machine for regulating, applying and releasing the fluid pressure in railway air brake apparatus, called "The Westinghouse Triple Value." Feb. 20, 1874.

3,130.—I. Dennis, New Market, York county, Ontario. Improvements in "Dennis' Economical Framed Log Barn," called "Dennis' Improved Frame Barn." Feb. 20, 1874.

3,131.—I. Kay, Indianapolis, Ind., U. S. Useful roller abstractor for lever watches, called "Kay's Roller Abstractor." Feb. 20, 1874.

3,132.—J. L. Cathcart, Washington, D. C., U. S. Useful improvements on propellers for vessels, called "Cathcart's Steering Propeller." Feb. 20, 1874.

3,133.—T. S. Hunt, Boston, Mass., U. S., and Jas. Douglas, Jr., Quebec. Improvement in the utilization of refuse or waste tinned sheet iron (commonly called tin plate), the title whereof is "A New and Useful Improvement in the Utilization of Refuse or Waste Tinned Sheet Iron (commonly called Tin Plate.) Feb. 20, 1874.

3,134.—A. H. Pedrick, Philadelphia, Pa., U. S., assignee of E. Pedrick, Petrolia, Ontario. New and useful traction hydraulic engine, called "Pedrick's New Traction Hydraulic Engine." Feb. 20, 1874.

HOW TO OBTAIN
Patents and Caveats
IN CANADA.

PATENTS are now granted to inventors in Canada, without distinction as to the nationality of the applicant. The proceedings to obtain patents in Canada are nearly the same as in the United States. The applicant is required to furnish a model, with specification and drawings in duplicate. It is also necessary for him to sign and make affidavit to the originality of the invention.

The total expense, in ordinary cases, to apply for a Canadian patent, is $75, U. S. currency. This includes the government fees for the first five years, and also our (Munn & Co.'s) charges for preparing drawings, specifications and papers, and attending to the entire business. The holder of the patent is entitled to two extensions of the patent, each for five years, making fifteen years in all.

If the inventor assigns the patent, the assignee enjoys all the rights of the inventor.

A small working model must be furnished, made to any convenient scale. The dimensions of the model should not exceed twelve inches.

If the invention consists of a composition of matter, samples of the composition, and also of the several ingredients, must be furnished.

Persons who desire to apply for patents in Canada are requested to send to us (Munn & Co.), by express, a model with a description, in their own language, showing the merits and operation of the invention, remitting also the fees as above for such term for the patent as they may elect. We will then immediately prepare the drawings and specification, and send the latter to the applicant for his examination, signature, and affidavit. It requires from four to twelve weeks' time, after completion of the papers, to obtain the decision of the Canadian Patent Office. Remit the fees by check, draft, or Postal order. Do not send the money in the box with model. Give us your name in full, middle name included

Inventions that have already been patented in the United States for not more than one year may also be patented in Canada.

On filing an application for a Canadian patent, the Commissioner causes an examination as to the novelty and utility of the invention. If found lacking in either of these particulars, the application will be rejected, in which case no portion of the fees paid will be returned to the applicant.

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VALUE OF PATENTS,
And How to Obtain Them.
Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than **FIFTY THOUSAND** inventors have availed themselves of the services of **MUNN & Co.** during the TWENTY-SIX years they have acted as solicitors and Publishers of the **SCIENTIFIC AMERICAN.** They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables **MUNN & Co.** to do everything appertaining to patents **BETTER** and **CHEAPER** than any other reliable agency.

HOW TO OBTAIN PATENTS

This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft or postal order, on New York, payable to the order of **MUNN & Co.** Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to **MUNN & Co.**, 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to **MUNN & Co.**, 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000, and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, when business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address **MUNN & Co.**, 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

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Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of fomer, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing **MUNN & Co.** 37 Park Row, New York.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address **MUNN & Co.** 37 Park Row, New York.

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Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto relievo, or bas relief any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to **MUNN & Co.**, 37 Park Row, New York.

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Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawing and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent. Address **MUNN & Co.**, Patent Solicitors, 37 Park Row, New York.

MUNN & Co. will be happy to see inventors in person at their office, or to advise them by letter. In all cases they may expect an *honest opinion.* For such consultations, opinions, and advice, *no charge is made.* Write plain; do not use pencil or pale ink; be brief.

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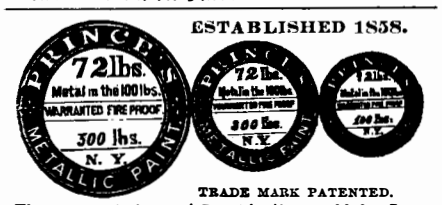

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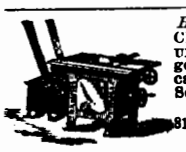

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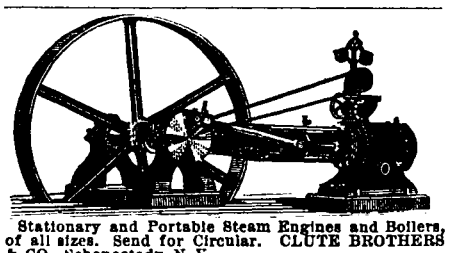

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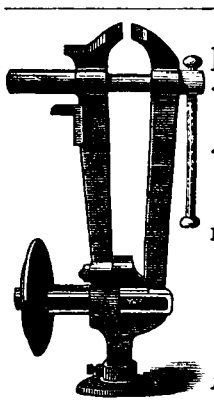

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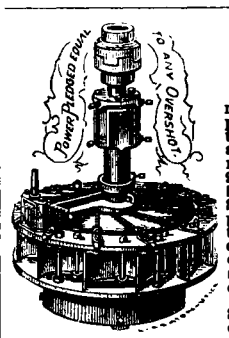

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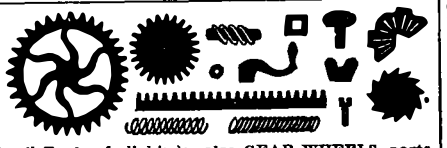

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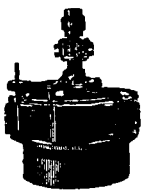

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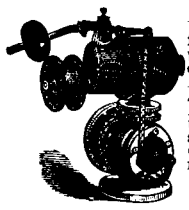

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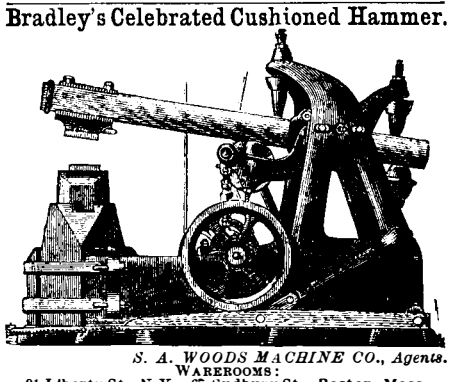

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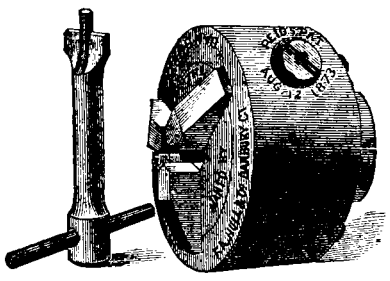

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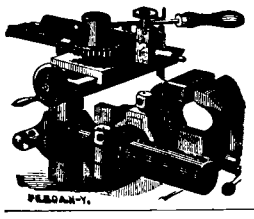

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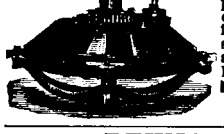

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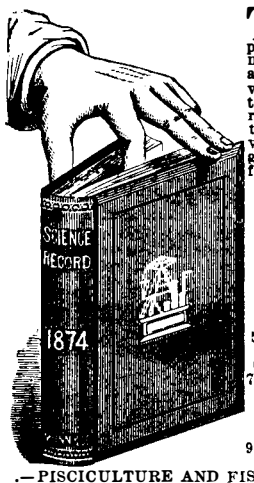

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